BROADCAST
NEWS

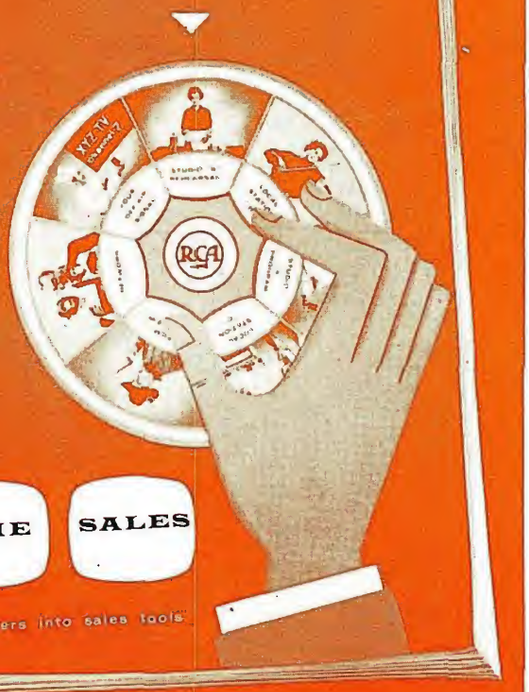
RCA®

25

Twenty Fifth Anniversary Issue

VOLUME NO. 91 OCTOBER, 1956

FREE BOOKLET



TUNE IN YOUR TIME SALES

RCA House Monitoring turns your receivers into sales tools

. . . TELLS HOW STATIONS CAN GIVE SERVICE THAT RATES HIGH WITH CLIENTS

"Tune in Your Time Sales" describes the benefits of the RCA House Monitoring System. It points out that with such a system the television station is better equipped for serving clients efficiently.

You can dial any local on-air signal . . . any studio signal wherever you happen to be in the station. What a service to sponsors this is in program planning! When a question is asked about other stations . . . competing programs . . . you're there with the proof! In special presentation in your own studio, or in viewing commercials, it's a tremendous assist to be as close to the "on-air" result as your nearest monitor.

Up to seven channels are available—tailored to your own special requirements. You can flip the switch and bring in whatever your client requires.

Fully rated for color, the RCA House Monitoring System is low in cost and easy to install and operate. Complete technical description of the equipment is included in this booklet.

Ask your Broadcast Sales Representative for a copy.

Your Off-Air Signal

Film Preview

Special Client Presentation in Your Studio

RADIO CORPORATION of AMERICA
BROADCAST AND TELEVISION EQUIPMENT CAMDEN, N. J.

In Canada: Write
RCA VICTOR Company Limited, Montreal

Vol. No. 91 | October, 1956

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CONTENTS

Unlimited system

plus superb picture quality...make RCA best

Improved technical quality in your film programs need not require a big investment

ICONOSCOPE CONVERSION

You can start simply and build gradually, if you prefer, first by converting iconoscope film cameras to RCA vidicon film cameras. You'll get marked improvement in gray scale, tremendously increased signal-to-noise ratio, improvement in resolution, and provision for automatic black level control . . . all with a minimum of operating attention. The "snap," clarity and live effect will be immediately reflected in advertiser preference.

MONOCHROME SYSTEM EXPANDABLE TO COLOR

Or, you can start with the superior vidicon film system expandable to color. Using the RCA TP-15 universal multiplexer, color and monochrome film equipment can be completely integrated—by adding a TK-26 color film camera at any time. This new multiplexer accommodates up to four projector inputs, all of which are available to two film camera outputs.

COLOR FILM SYSTEMS

To go to color *now,* you can select from various equipment combinations which use the RCA TK-26 three-vidicon film camera. In TV stations where superb picture quality and operational simplicity count, the TK-26 is the preferred system for color film programming. It has been selected after careful comparative evaluation with other systems and found to produce finer quality film pictures in both monochrome and color. Superior results are achieved at minimum cost with maximum operational simplicity.

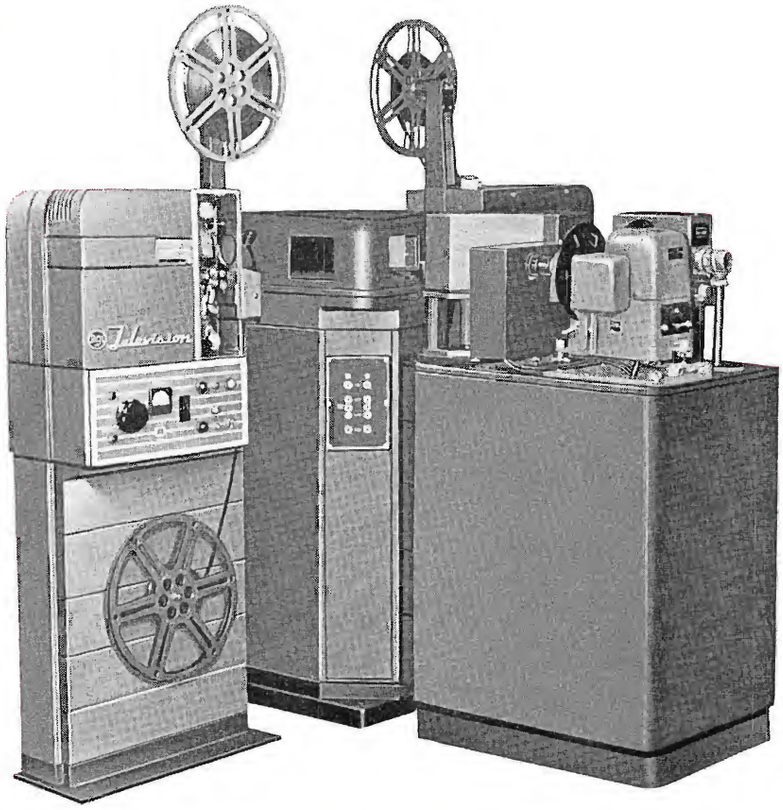
LIVE COLOR, TOO

It is possible to use the RCA three-vidicon film system for pickup of opaques, live commercial products and demonstrations within a limited area.

See your RCA Broadcast Representative for more details on Vidicon Film Systems. He will be glad to answer your questions. Let him help plan a film system that can start you on the road to the new and additional revenue that will come from color!

NEW STANDARDS OF QUALITY

The RCA Vidicon Film System has established a standard of film reproduction by which all other methods are judged. You can expect and get the highest quality reproduction, with protection against obsolescence for years to come. To give some idea of the wide range of system possibilities with RCA equipment we submit four diagrams, at right, from the very simplest equipment to a Dual Color Film System.



Monochrome film system expandable to color.

RCA®

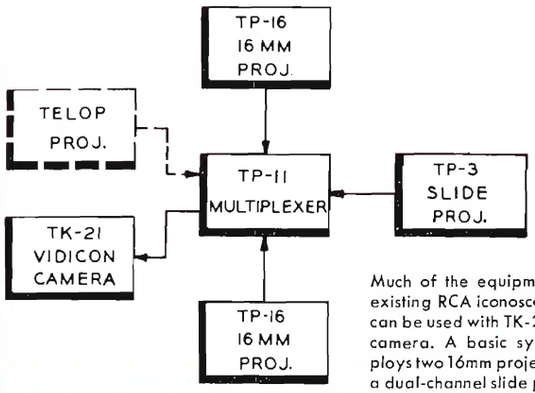
RADIO CORPORATION of AMERICA

BROADCAST AND TELEVISION EQUIPMENT **CAMDEN, N.J.**

possibilities . . .

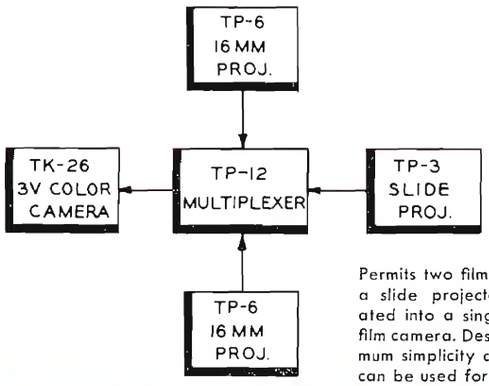
buy in film equipment—monochrome and color

1. CONVERSION OF ICONOSCOPE FILM SYSTEM TO VIDICON



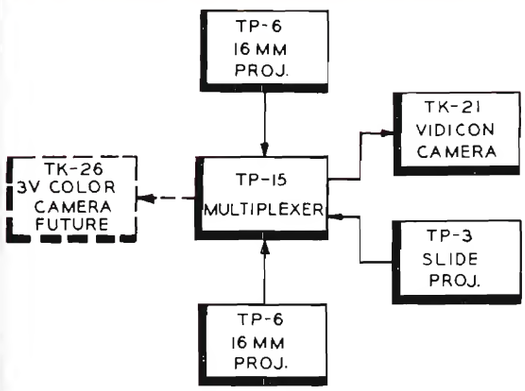
Much of the equipment in an existing RCA iconoscope chain can be used with TK-21 vidicon camera. A basic system employs two 16mm projectors and a dual-channel slide projector.

3. BASIC COLOR FILM SYSTEM



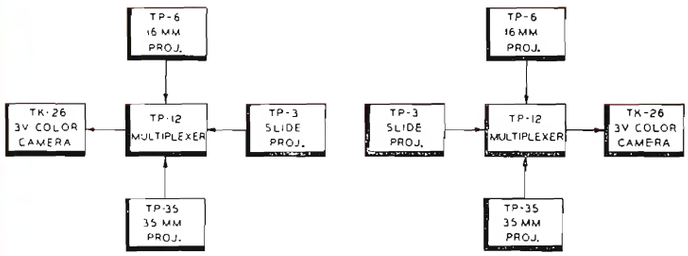
Permits two film projectors and a slide projector to be operated into a single TK-26 color film camera. Designed for maximum simplicity and economy, it can be used for both color and monochrome film.

2. MONOCHROME FILM SYSTEM EXPANDABLE TO COLOR



Combines a TK-21 monochrome film camera with projectors and multiplexing equipment, which are usable in color as well as monochrome. At any time a TK-26 color film camera can be added, retaining the TK-21 for the monochrome channel.

4. DUAL COLOR FILM SYSTEM



Will handle a large number of inputs and therefore provides maximum program protection. Two completely independent program channels provide the ultimate in reliability and ossure continuous programming. Permits previewing in color.

Best for color and monochrome because it uses proved-in components!

VIDICON TUBE . . . . RCA development

Vidicon storage tube is outstanding from standpoint of high signal-to-noise ratio, reliability and low-cost operation. It produces a sharp lifelike picture—equally good in monochrome or color. Replacement involves minimum of equipment readjustment.

STANDARD-TYPE PROJECTORS FOR 35 and 16MM

Standard of the motion picture industry, the intermittent projector produces a beautiful steady picture. It involves none of the critical mechanical tolerances of the continuous projector for 16mm. RCA now offers the TP-6 series projector designed from the beginning for professional 16mm television use. Provides maximum video and audio quality with operating convenience and dependability. RCA neutral-density-filter light control makes it possible to achieve satisfactory results with practically all kinds of film.

NEW TYPE TP-15 MULTIPLEXER

Provides for complete integration of color and monochrome. Offers flexibility and protection of two-camera system without the necessity of buying separate projectors for each camera. Permits preview of one program while another is on-air.

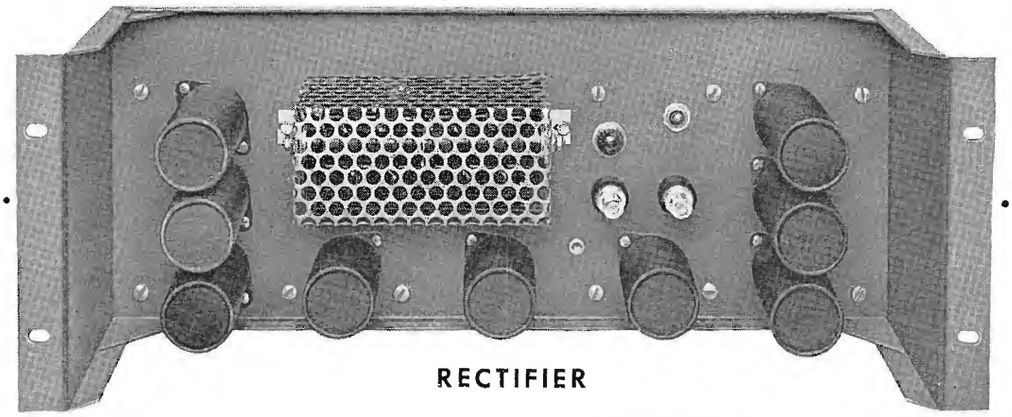
OPERATING CONVENIENCE AND SIMPLICITY

Only two simple controls are employed in "on-air" operation. Pedestal level and Master Gain. For assuring picture perfection, all controls, together with waveform and picture monitors, are located at the operating position.

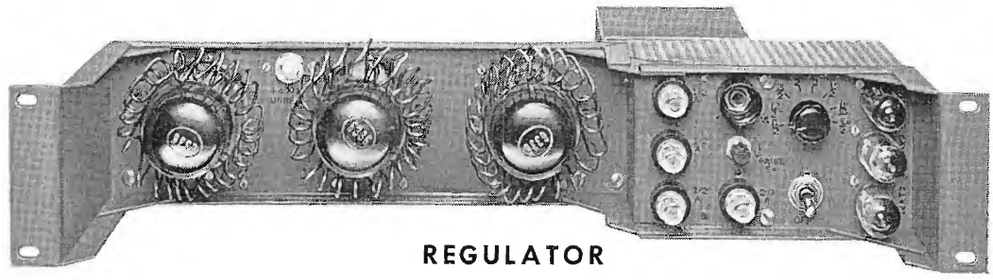
New! Space-Saving

These Advanced Features:

- Compact—requires only 10½" rack space.
- 1500 ma output at 280 volts regulated.
- High efficiency. Less power lost as heat.
- Uses only 6 tubes.
- New high-efficiency germanium rectifiers.
- Two-chassis construction for maximum flexibility.
- Only $675 complete.



RECTIFIER



REGULATOR

New RCA WP-15 Power Supply

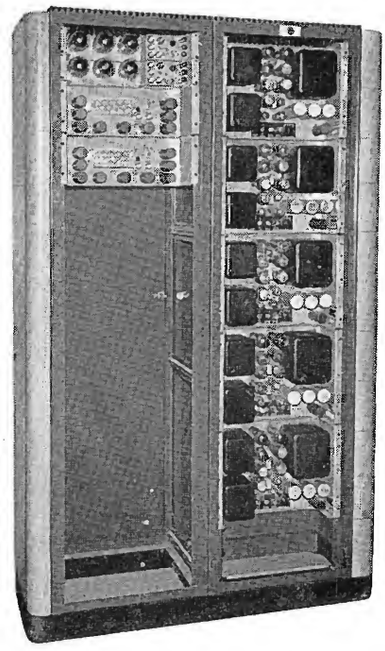
highlights two-chassis construction. The rectifier chassis contains all the rectifier and filter elements. The regulator chassis contains a full complement of 6 tubes and regulating elements.

System Simplification

By separating the functions of rectification and regulation it has made it possible to place all the rectifier chassis at one location. Regulator sections can thus be arranged in a location adjacent to equipment loads. If desired the rectifier and regulator chassis can be mounted together as a complete power supply, occupying only 10½" space.

New Safety Features

Heavy-duty on/off switches are provided on both rectifier and regulator. Both can be remote controlled from regulator, eliminating presence of high voltage when the regulated voltage may be off. Indicating type fuses are used in ac power input line. Each regulator tube is individually fused to prevent overload in case of failure of any other regulator tubes. Indicator lamps on front and rear of both chassis warn of presence of high voltage. Entire power supply is completely covered to prevent contact with terminals carrying high voltage.

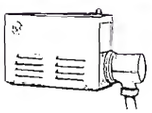
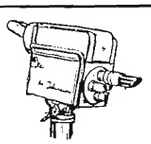
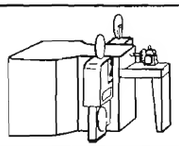
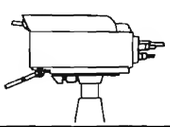


Two WP-15's (mounted at left) are equivalent to five WP-33B's.

RCA Power Supply WP-15

Up To 70% Reduction in Rack Space
Priced at Only 45c per Milliampere!

Check and Compare! Use this chart to find out your own savings potential.

EQUIPMENT USED	PREVIOUS POWER SUPPLY AND SPACE NEEDED	POWER SUPPLY AND SPACE *NOW* NEEDED	WP-15 SAVING
 TK-21 Black and White Film Camera	2 WP-33B's 28″	1 WP-15 10½″	**17½″**
 TK 11/31 Black and White Live Camera	2 WP-33B's 1 580D 38½″	1 WP-15 10½″	**28″**
 TK-26 Color Film Camera	2 WP-33B's 3 580D's 59½″	2 WP-15's 21″	**38½″**
 TK-41 Color Live Camera	3 WP-33B's 2 580D's 63″	2 WP-15's 21″	**42″**

NOTE: Comparisons are based on the number of WP-33B and 580D power supplies necessary to provide 1500 ma.

High current capacity, small size, light weight and lowest cost per milliampere make the WP-15 excellent in television broadcasting, closed circuit and laboratory applications. Your RCA Broadcast and Television Sales Representative will be glad to supply additional information. IN CANADA: write RCA VICTOR Company Limited, Montreal.

RADIO CORPORATION of AMERICA

BROADCAST AND TELEVISION EQUIPMENT • CAMDEN, N. J.

WWJ-TV — A CUSTOM

STUDIO INSTALLATION

FIG. 2. Mr. E. K. Wheeler, General Manager of WWJ-AM/FM/TV.

Plans for WWJ's impressive studio building in downtown Detroit were first conceived in 1947, a year after the Channel 4 NBC affiliate received its television CP. Telecasting operations began in March of 1947, as WWJ broadcast from studios located in their radio building. The need for new quarters soon became apparent as the television operation proceeded to outgrow the available space.

Construction of the new building was authorized in November of 1951 by the Evening News Association, owners of The Detroit News and WWJ-AM/FM/TV. Shortages of materials, such as copper, created by the Korean War hampered construction and later equipment procurement. In spite of this, 1952 saw the completion of the new home of WWJ-TV. A shotsawn limestone exterior covers the masonry and steel structure which is skillfully related by glass section to the radio building.

According to E. J. Love, General Engineering Manager, the plant facilities represent a composite team effort in planning. Their engineering department, composed of men like R. P. Williams, Chief Engineer (Studio); A. G. Sanderson, Chief Engineer (Facilities); C. H. Wesser, Chief Engineer (Radio); and H. F. Tank, Chief Engineer (Transmitter) worked with engineers from RCA to produce one of the biggest custom installations in the country.

The building has been completely designed around a highly demanding electrical installation. Since the technology of television is still rapidly developing, wiring is designed, not only for the present heavy electrical load, but to provide for future changes. The building contains about 120 miles of wire, not counting telephone and light circuits. Cable runs are made through open ducts to a central vertical shaft running from the basement to the master control room on the second floor. The maze of conduits, piping and cables required are concealed in the floor slabs.

Control rooms for the three large studios are located directly beneath the master control room in order to concentrate all electronic and electrical circuits. The structural design of the building provides for two additional floors for possible future expansion.

FIG. 3. Downtown studio building of WWJ-AM/FM/TV.

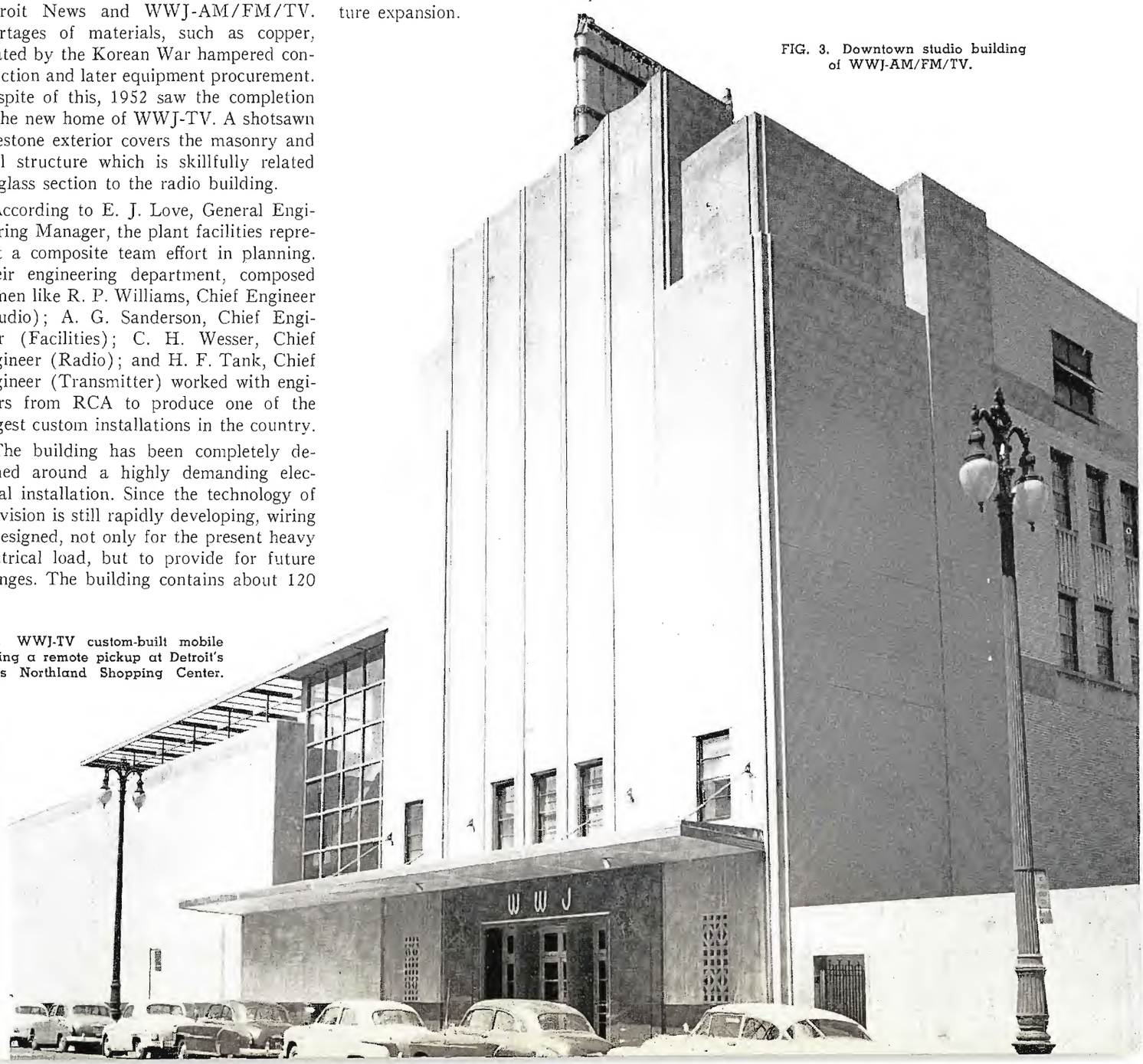


FIG. 1. WWJ-TV custom-built mobile unit doing a remote pickup at Detroit's fabulous Northland Shopping Center.

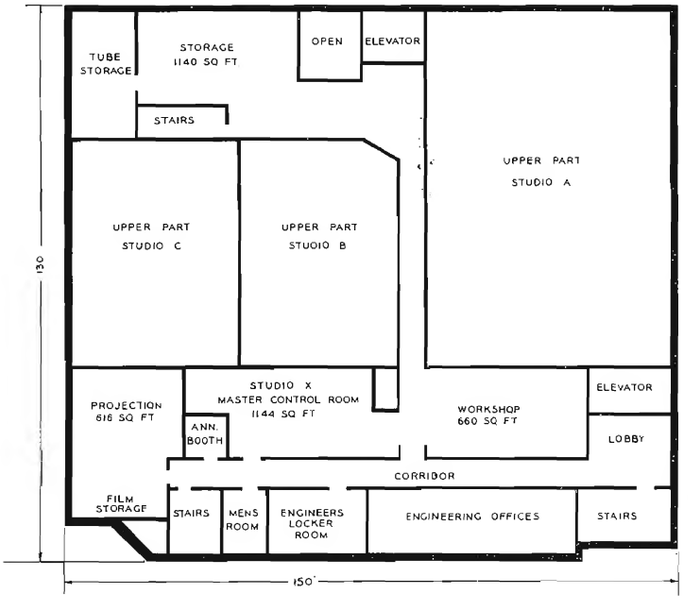


FIG. 4. Floor plan of second floor where Master Control and Studio "X" are located.

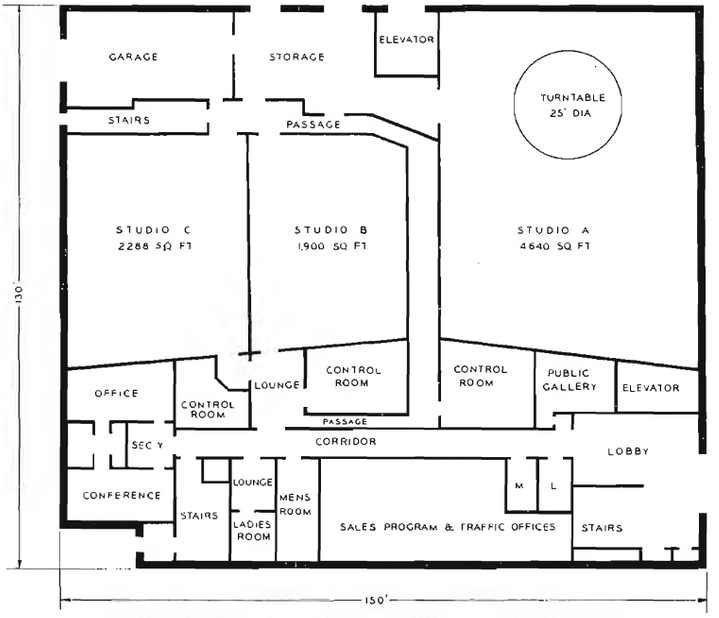


FIG. 5. First floor plan of WWJ studio building showing the station's three television studios.

Television Studios

Interest on the first floor centers around the three studios. Largest and most elaborate is Studio A, measuring approximately 58 by 80 ft, or 4,640 sq ft. One of the main features of this studio is a 25-ft diameter turntable built flush to the floor. Here, automobile commercials are produced to advantage as the rotating turntable presents a continuously changing product view.

This studio, with 221 ft of wall space available for stage sets, handles productions that require elaborate settings and space. For example, a number of different sets are required to produce such shows as "Michigan Outdoors", a program covering sports, hunting and fishing. Programming, where two or three shows are lined up back to back or special shows usually originate from Studio A.

In order to accommodate visitors, a public gallery measuring 11 by 17 ft, has been provided at one end of the studio next to the control room. There are seating facilities here for about fifteen people, either visitors or clients.

Cinder concrete block walls are used throughout the building as well as in the studios, providing good sound absorption and freedom from pronounced resonances. No acoustical flats are employed in the studios—the feeling being that live sets in themselves provide enough acoustical treatment. This has proven to be a very satisfactory approach.

Studios B and C are somewhat smaller than Studio A. Studio B contains approximately 1,900 sq ft with 146 ft of wall space for sets. Studio C is slightly larger with 2,288 sq ft and 162 ft of wall space. Permanent-set shows such as sportscasts and news programs usually originate from Studio C.

At the end of each studio is a control room, designed so that the booth floor level is 4 ft above the studio floor. The control rooms were raised for visual reasons to give complete visibility and avoid clutter in front of the control room windows.

Each of the three studios at WWJ is a separate entity. An r-f monitor distribution system is fed to every studio with three outlets in the studio and one in the control room. Four TK-10 image orthicon cameras are used in the large studio, with Studio B having three TK-10's and Studio C equipped with two TK-30 field cameras. These RCA TK-30's are from the first production run in 1946 and are still giving excellent service.

About 150 tons of air refrigeration equipment are required to handle the tremendous heat load given off by the high lighting intensities necessary in the studios and the heat given off by operating equipment in the control rooms. Unusually large ducts provide air supply at velocities low enough to be noiseless.

Noticeably longer image orthicon life has resulted from the installation of the air-conditioning system which cools the studios down to approximately 68 degrees F.

FIG. 6. Automobile commercials are done in Studio A on the large 25 ft diameter turntable.

FIG. 7. General view or Studio A during a television rehearsal.

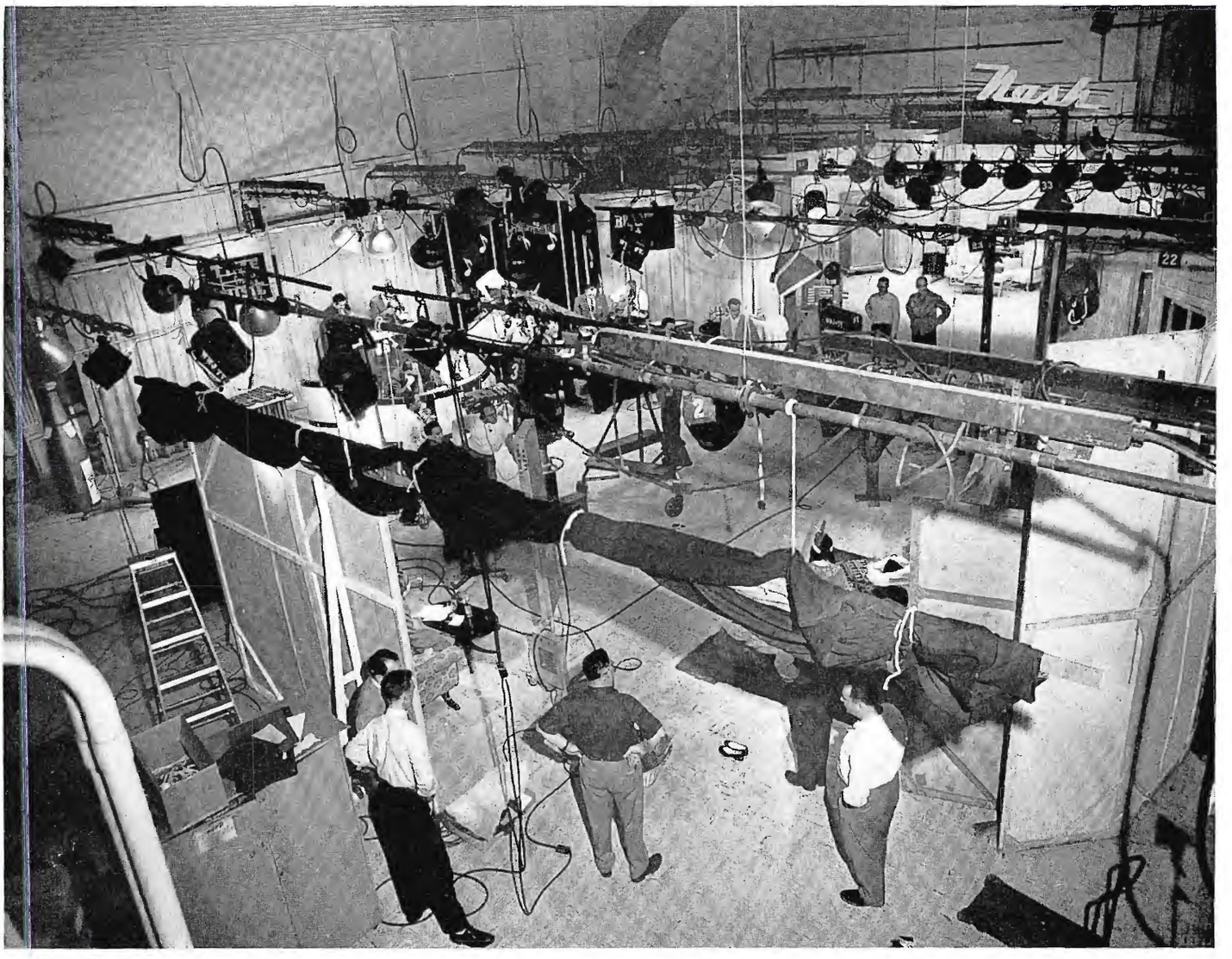


FIG. 8. Studio B handles one of the commercials for "Michigan Outdoors" show.

FIG. 9. The motor-driven pipe battens, providing support for lighting in Studio B, are controlled by wall-mounted push-button switches.

Lighting

At WWJ lighting is a program department function and is of the "off-the-floor" type. All scoops and spots are hung from 2-inch pipe battens supported by wire cables at either end. Thus, with very few exceptions, the studio floor is not cluttered by dolly-mounted light units. The pulleys supporting the cables are attached to lengths of angle iron anchored in the ceiling. A total of eighteen pipe battens are used in Studio A. Nine battens are hung down one half of the studio and nine down the other half. Wall-mounted push-button switches control the motor-driven pipe battens—raising or lowering them as long as the push-button is depressed. Two control boards make 120 lighting outlets switchable or dimmable, either individually or collectively in the large studio. Since regularly scheduled shows set a pattern, all lights are set according to lighting tables—with each light individually adjustable.

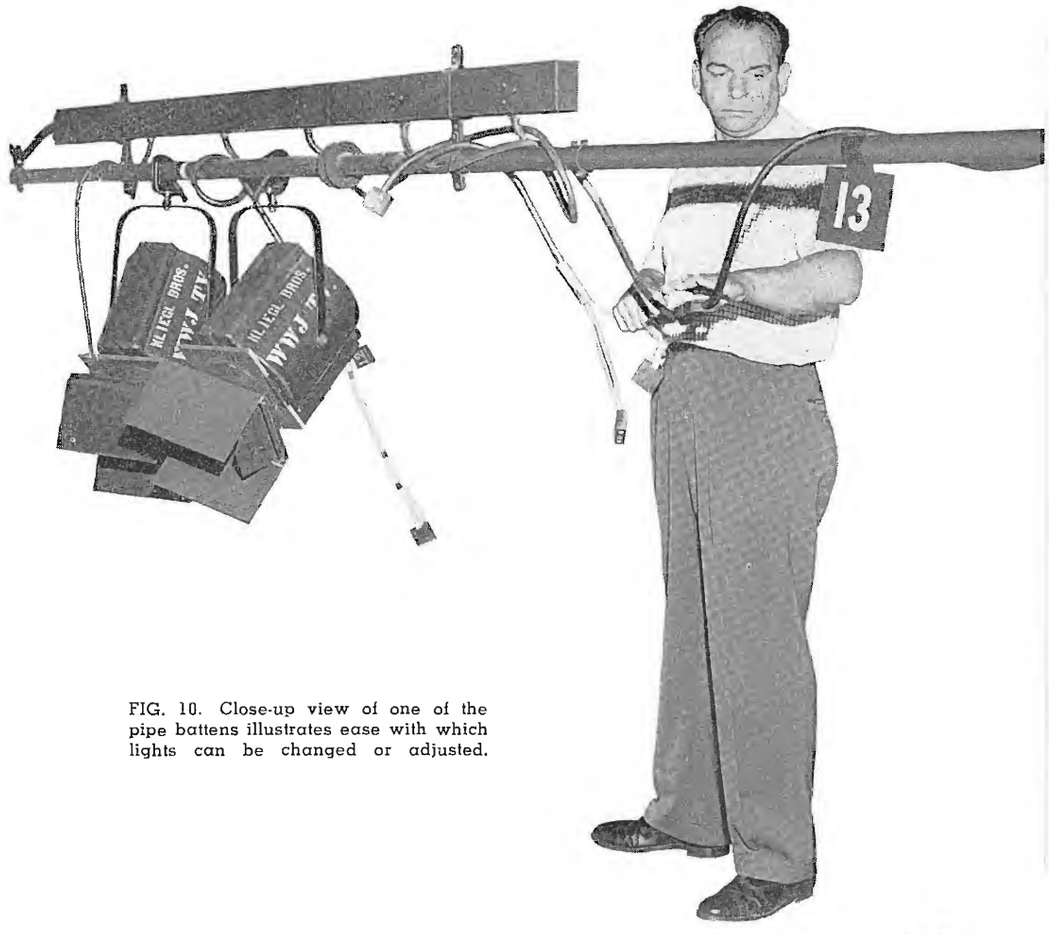


FIG. 10. Close-up view of one of the pipe battens illustrates ease with which lights can be changed or adjusted.

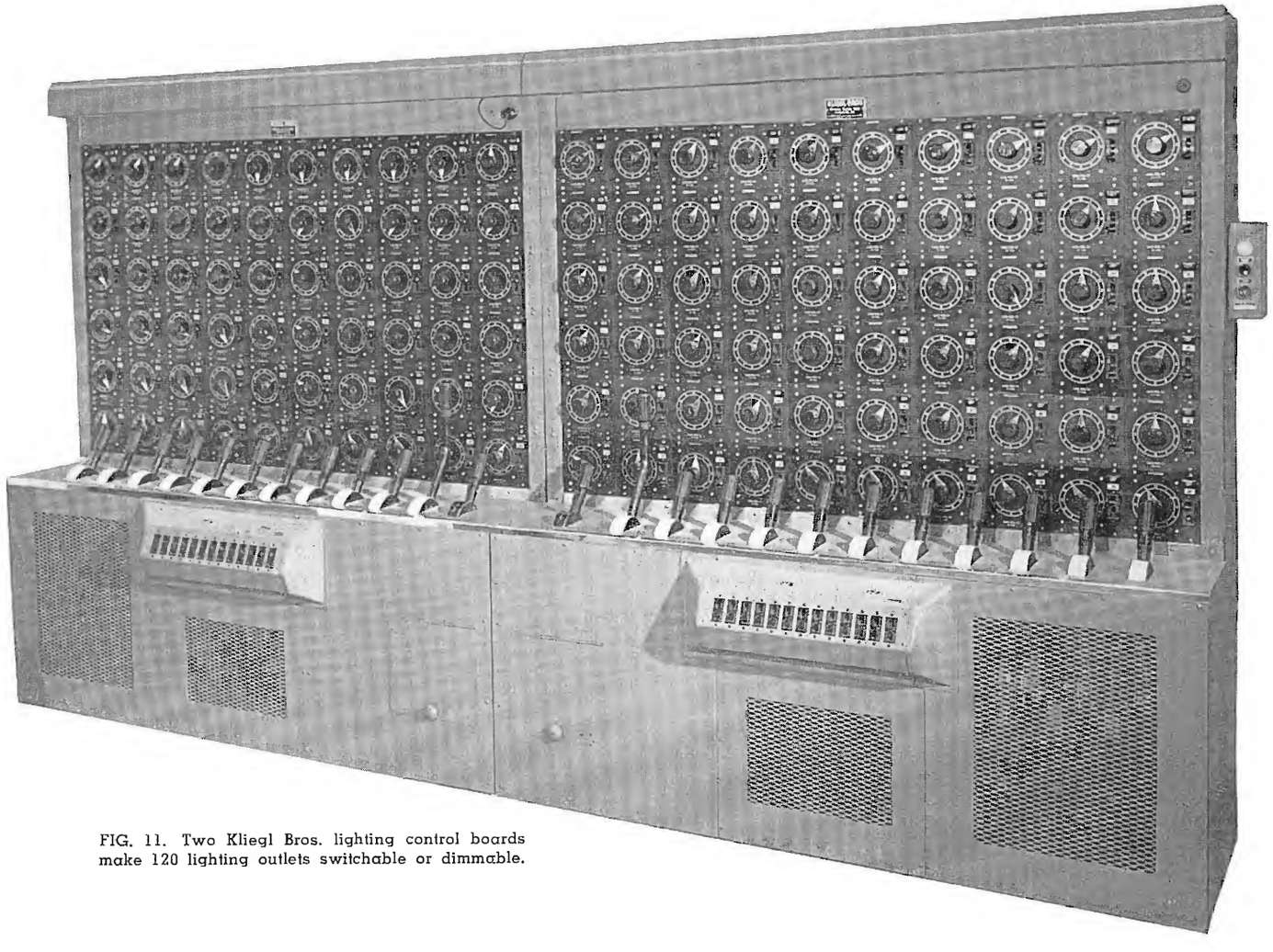
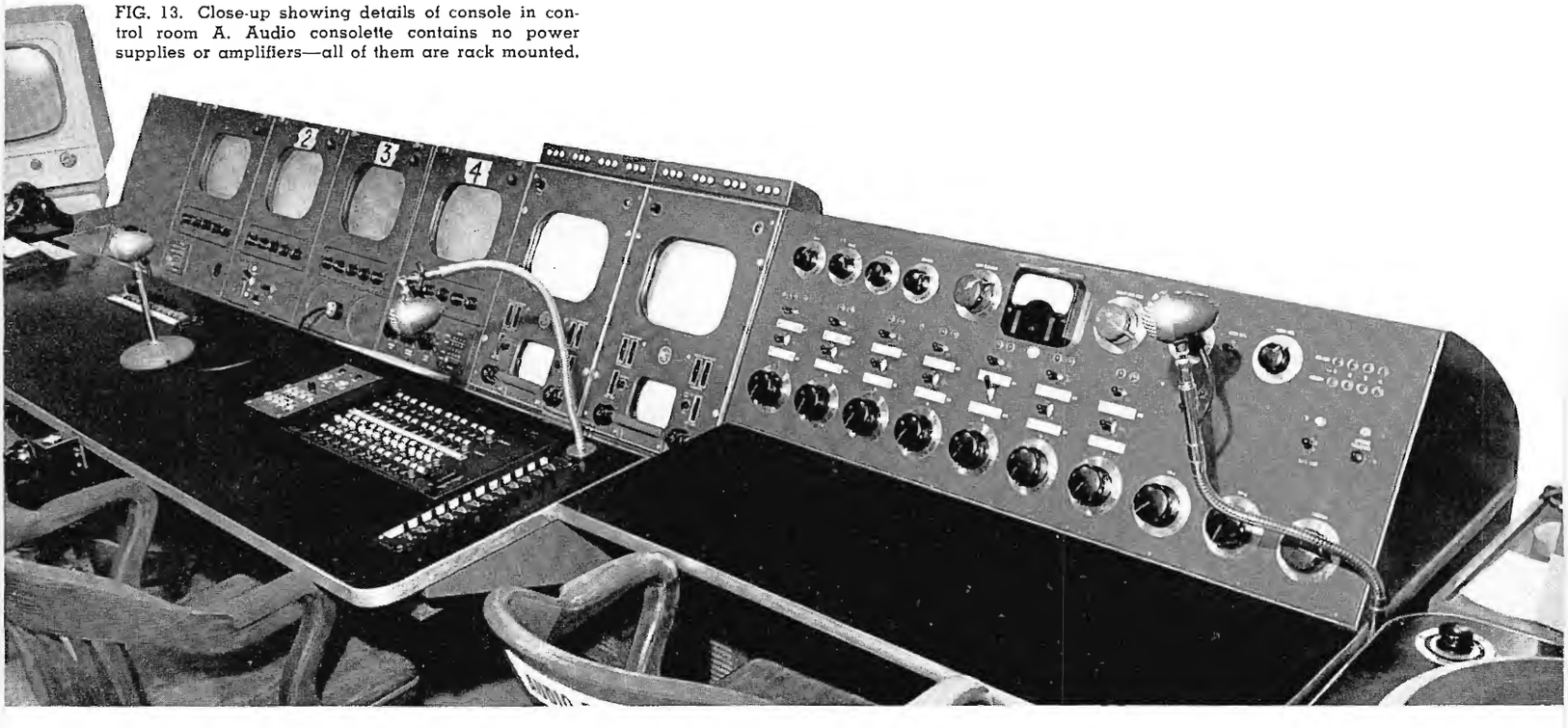


FIG. 11. Two Kliegl Bros. lighting control boards make 120 lighting outlets switchable or dimmable.

FIG. 12. Studio A control room—note equipment bays at extreme right. Control rooms B and C are similar in layout.

FIG. 13. Close-up showing details of console in control room A. Audio consolette contains no power supplies or amplifiers—all of them are rack mounted.



Control Rooms

All of the control rooms are located at one end of their respective studios, affording excellent visibility into the studios. Equipment layouts are almost identical in each of the control rooms.

At the main console located in front of the control room window the director, technical director and audio operator carry out their program functions. Four camera monitors and a row of intercom switches directly in front of the director allow him to exercise tight control over programming. An important part of this console is the push-button control panel of the TS-20 remote control switching system which provides complete facitities for program monitoring, video switching, remote pickups and network programs. Two master monitors are used—one for previewing and one for monitoring the outgoing line.

A custom designed RCA seven channel split-mixer audio consolette provides all the audio switching, control and monitoring facilities required. Input cutovers are provided on each preamplifier input. Control of all inputs can be handled by either one of the two sub-masters. These sub-masters are in turn controlled by the master fader. All amplifiers and power supplies for this audio consolette are rack mounted—no tubes are mounted in the console housing itself. Two standard, three-speed BQ-2A turntables are located immediately to the right of the audio consolette.

A video console, housing the four camera control units and a master monitor, is located just to the left of the control room window. Monitoring of either local or network color programs is possible in each control room, since they are equipped with standard 21-inch color receivers.

Three bays behind the audio operator's position complete the equipment layout in the control room. One is a low-level bay for program audio—another, the high-level bay includes intercom facilities. A varistor-type limiter keeps the level down on the intercom from control room to cameras. Distribution amplifiers and power supplies for the cameras make up the balance of chassis in the cabinet racks. The air in all of the control rooms is used twice—once to cool the booth and then the equipment racks. All of the custom-built consoles are exactly the same in each control room except for numbers of camera control units and monitors.

The height of the control room floor above studio floor level permitted the construction of a 4-ft crawl space under each control booth. An 8 by 14-inch cable trench in the control room floor carries all cabling from the booth into the crawl space where the cables are then fed to a main cable shaft and thence to MCR.

FIG. 15. A. G. Sanderson is Chief Engineer of Facilities of WWJ.

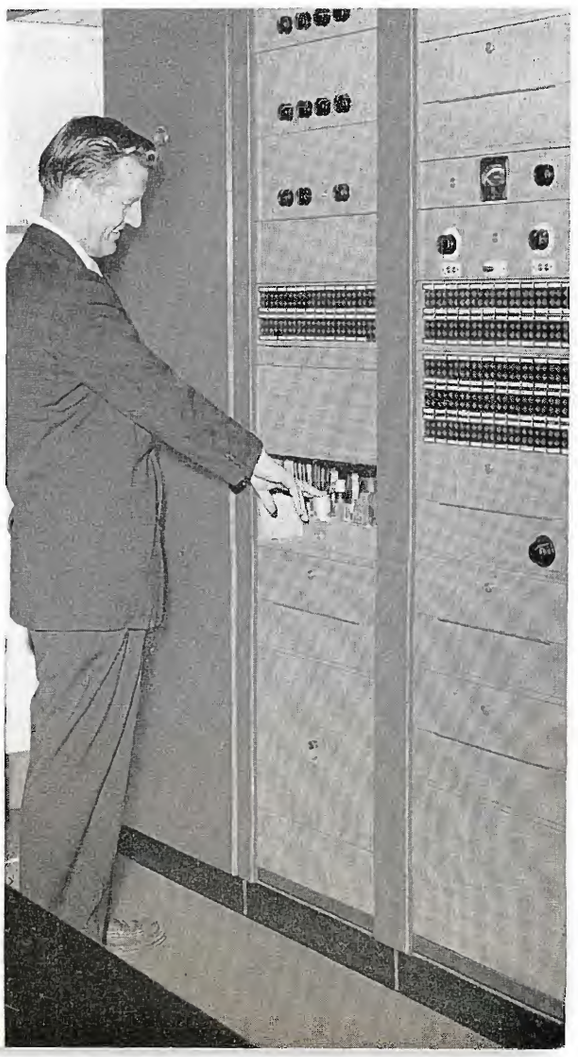


FIG. 16. Chief Engineer (Studio) at WWJ is R. P. Williams, shown at one of the equipment bays in control room A.

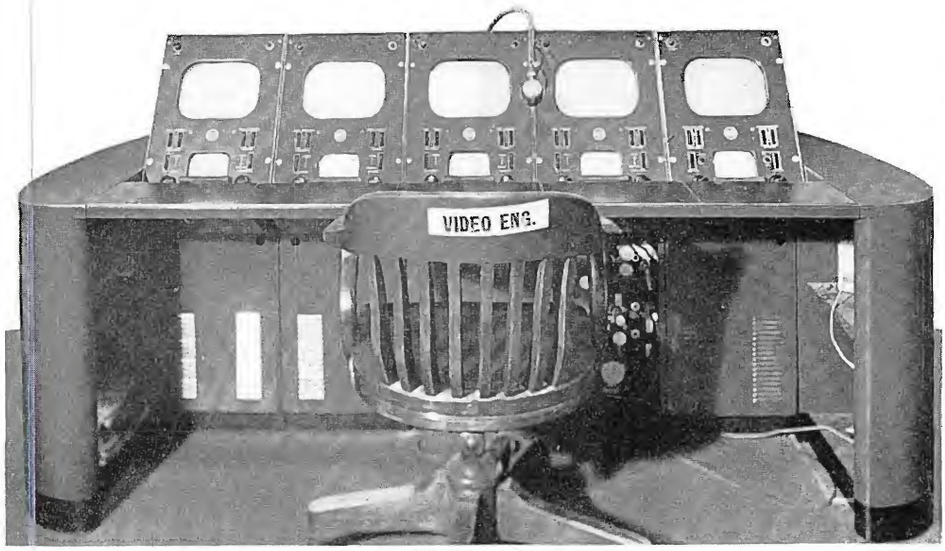


FIG. 14. Video engineer's position faces wall to the left of the main control console.

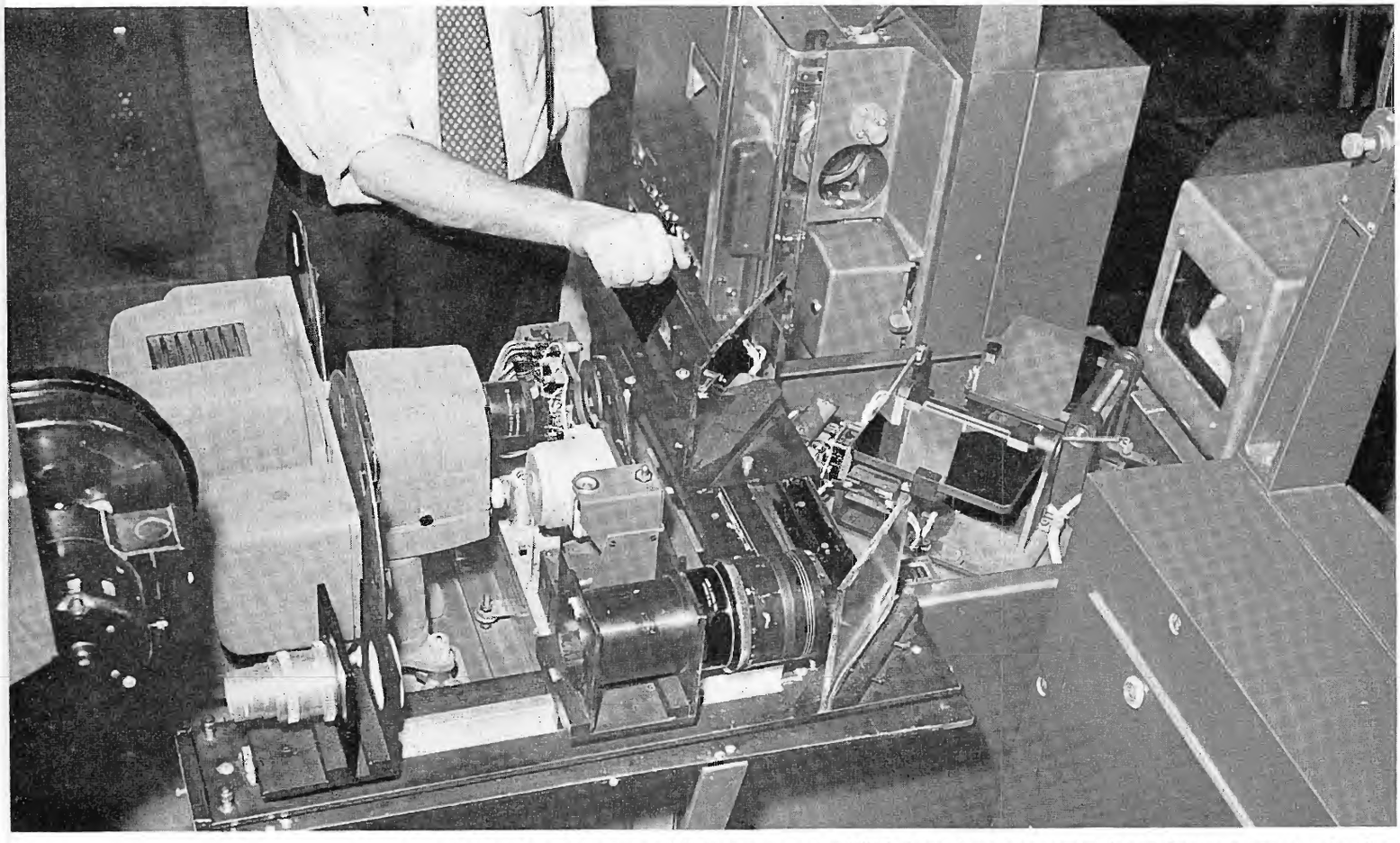


FIG. 17. View of optics of 3-V System in use at WWJ shows lens arrangement for producing opaques on bracket-mounted metal plate. Projectionist can easily switch from opaque to slide-projector input as shown above.

FIG. 18. Each one of the TK-20 Iconoscope Film Chains has a TP-16 16mm Film Projector and two slide-projector inputs.

Film Projection Room

Two TK-20 Iconoscope Film Chains and one TK-26 3-Vidicon Color Film Camera Chain comprise the major equipment facilities in the film room located next to master control on the second floor.

Opaques, both color and monochrome, are playing an important and ever-growing part in WWJ-TV's 3-V system. By means of a simple extension lens system the 3-V system can produce opaques or live color commercials of actual products. According to Russ Williams, Studio Chief, a bread-board model of the opaque optical setup had just been completed when the February issue of BROADCAST NEWS came out with an article on this very subject.

Numerous advantages accrue from the use of opaques. The large 14 by 17 inch cards with 3-inch borders all around are much easier for an artist to handle and work on. It is extremely difficult to get small artwork done quickly—now artwork on opaques can be done in minutes at the station's art department. All station i.d.'s are done in color if possible.

By using opaques in the 3-V system for monochrome operation, instead of employ-

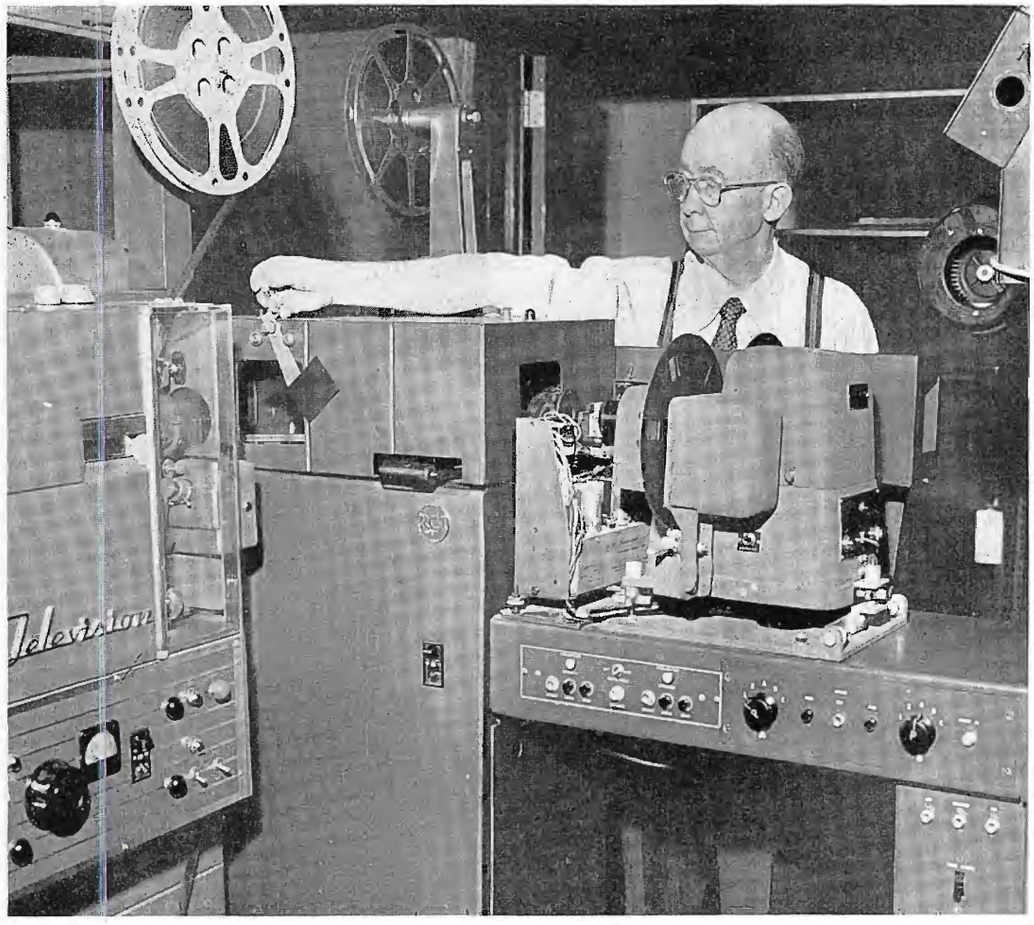


FIG. 19. Tom O'Toole, Senior Projectionist, is shown operating the douser which he designed.

ing a black-and-white image orthicon camera, work has been taken out of the WWJ studios resulting in a less costly operation since a camera crew is not needed and a studio is not tied up. As a result, image orthicon operating hours have been reduced and a worthwhile saving effected.

A bank of six RSP2 500 watt spots mounted under a metal hood are directed through a sheet of heat-absorbing glass onto the color opaque. Cooling is provided by a blower mounted under the lights as the airflow is directed out through a vent in the top of the hood.

Two TP-6 16-mm film projectors and a Gray Telojector for 35-mm slides feed into the TP-12 multiplexer portion of the 3-V system. A unique douser arrangement designed by Tom O'Toole, Senior Projectionist, gives smoother programming to WWJ's film presentations. The douser, shown in Fig. 19, (one for each projector) consists of a flat movable metal plate mounted on the multiplexer chassis. This plate is interposed between the multiplexer optics and the projector lens before the film is run through the 3-V system. Thus, the projectionist can see the end of the leader and cut the douser out at exactly the right point, eliminating the annoying clutter that is sometimes seen on TV receivers just prior to a film presentation.

Each of the iconoscope film chains has a TP-16 16-mm film projector, one Selectomatic Jr. slide projector and a standard 35-mm slide projector associated with it. The projectors can be controlled from any one of the three studios—a push-button control panel being located to the left of the switcher control panel in each studio control room. Film sound is also fed to each of the studio control rooms.

Some film storage as well as editing and splicing of film is handled in the projection room, but the major portion of this activity is located in the lower level below the first floor.

A line of monitors has been placed above the window separating MCR and the projection room. Here, monitors for both the iconoscope film chains, preview and outgoing lines are located. The 3-V system has two separate monitors, one for color and the other a black-and-white monitor for the green channel of the 3-V film chain.

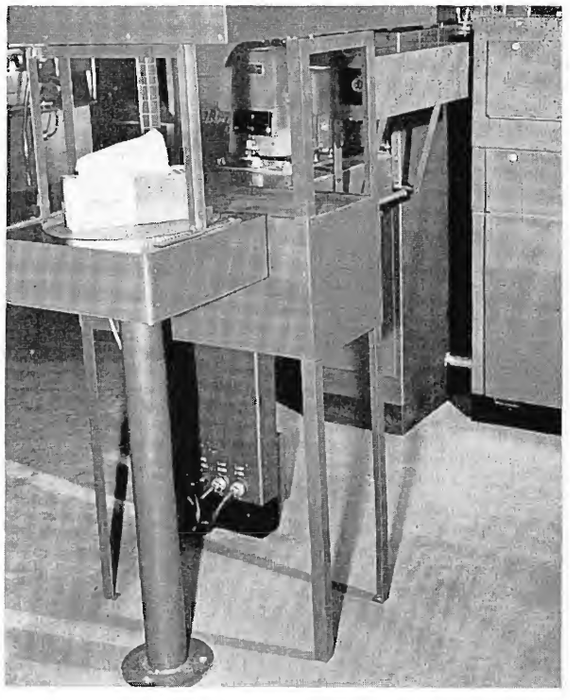


FIG. 20. This arrangement is employed for producing opaques, or live commercials using 3-V System. Note the product on the turntable (left)—optical setup is mounted on brackets and can be seen to the left of the TP-6 16mm projector.

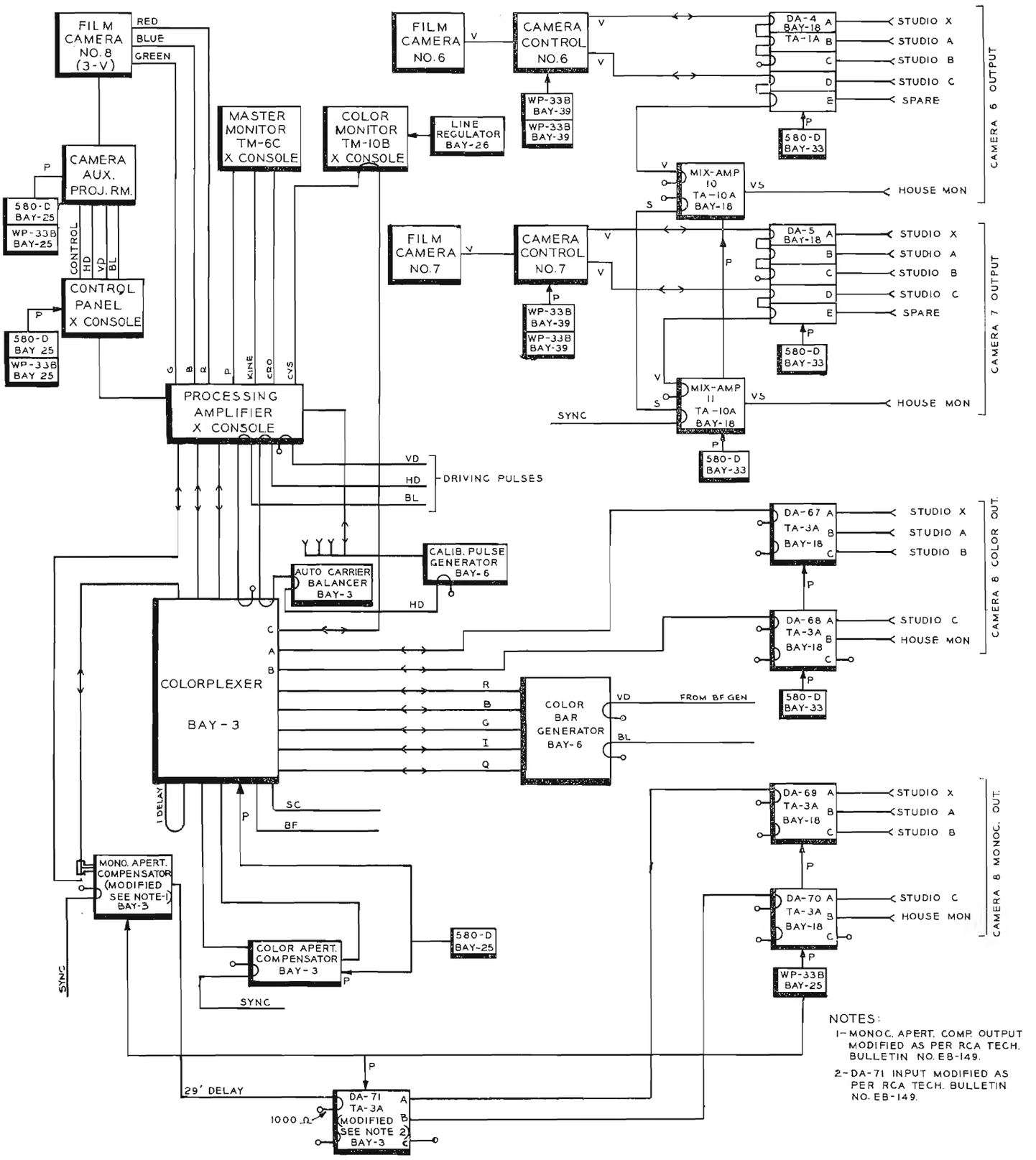


FIG. 21. Pulse distribution diagram of the film facilities—both color and monochrome—at WWJ-TV.

FIG. 22. Master Control facilities at this console include audio and video switching panels, master monitors and an audio ringdown and remote panel. The booth shown is the Studio "X" announce booth where any or all of the four outgoing audio channels can be overridden.

Master Control

Nerve center of the operation is the large Master Control area which occupies an area of approximately 1,144 sq ft on the second floor of the building. Station operation in this area has been divided into a master control function and a Studio "X" concept which can operate as a sub-master control. A Studio "X" announce booth is located at one corner of MCR.

At WWJ, a preset switching system is in effect in MCR which is a direct outgrowth of the audio preset system used in their radio operations. In this arrangement, the push-button switch normally employed for channel selection is dead and may thus be set up for the next channel setup to be put on the air. A trip button will then cause one or several channels to transfer to the new preset schedule. Normally, master control itself is not manned at WWJ—only unusual or special events requiring operator attendance.

The MCR video switching panel is capable of switching 12 inputs to 2 outgoing channels and a preview bus. Each one of the outgoing feeds has a right and left bank. One bank can be used for a preset condition while the other bank is being used on air. Actual switching is handled by a transfer switch at the bottom of the panel. Push-button switches of the nonlocking, illuminated variety are employed for operating video relays. The preview channel can be punched up on any one of the inputs.

There are facilities for switching two outgoing video lines and four outgoing audio lines. Three master monitors are employed, one for each of the two outgoing video lines and one for previewing. The four separate audio switching panels are located at the extreme right of the master control console. Usually, audio is locked to video switching so that the video is followed by audio switching—however, audio can be switched separately.

Two audio switching circuits are contained in each audio switching panel. Here 12 inputs are switched to 2 outgoing channels. A left and right bank are associated with each channel. While one is in use, the other channel can be employed for preset. Audio relays are operated by mechanically interlocked push buttons. Switching of audio is accomplished by a transfer switch at the bottom of the panel. Each channel has a VU meter associated with it.

An audio ringdown and remote panel in the MCR console provides ring and talk facilities for 12 lines. Mechanically interlocked selection for the 12 incoming program lines are provided on remote busses.

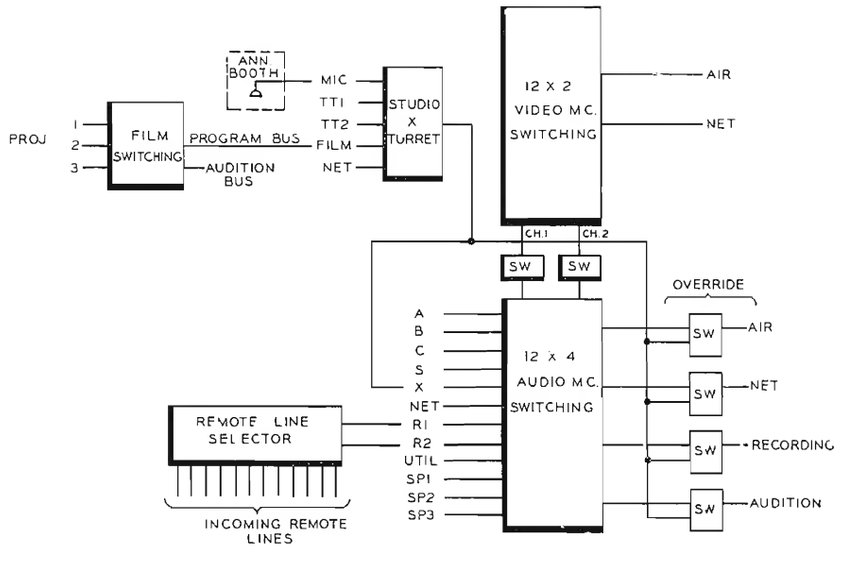


FIG. 24. Simplified block diagram of WWJ-TV's Master Control Switching System.

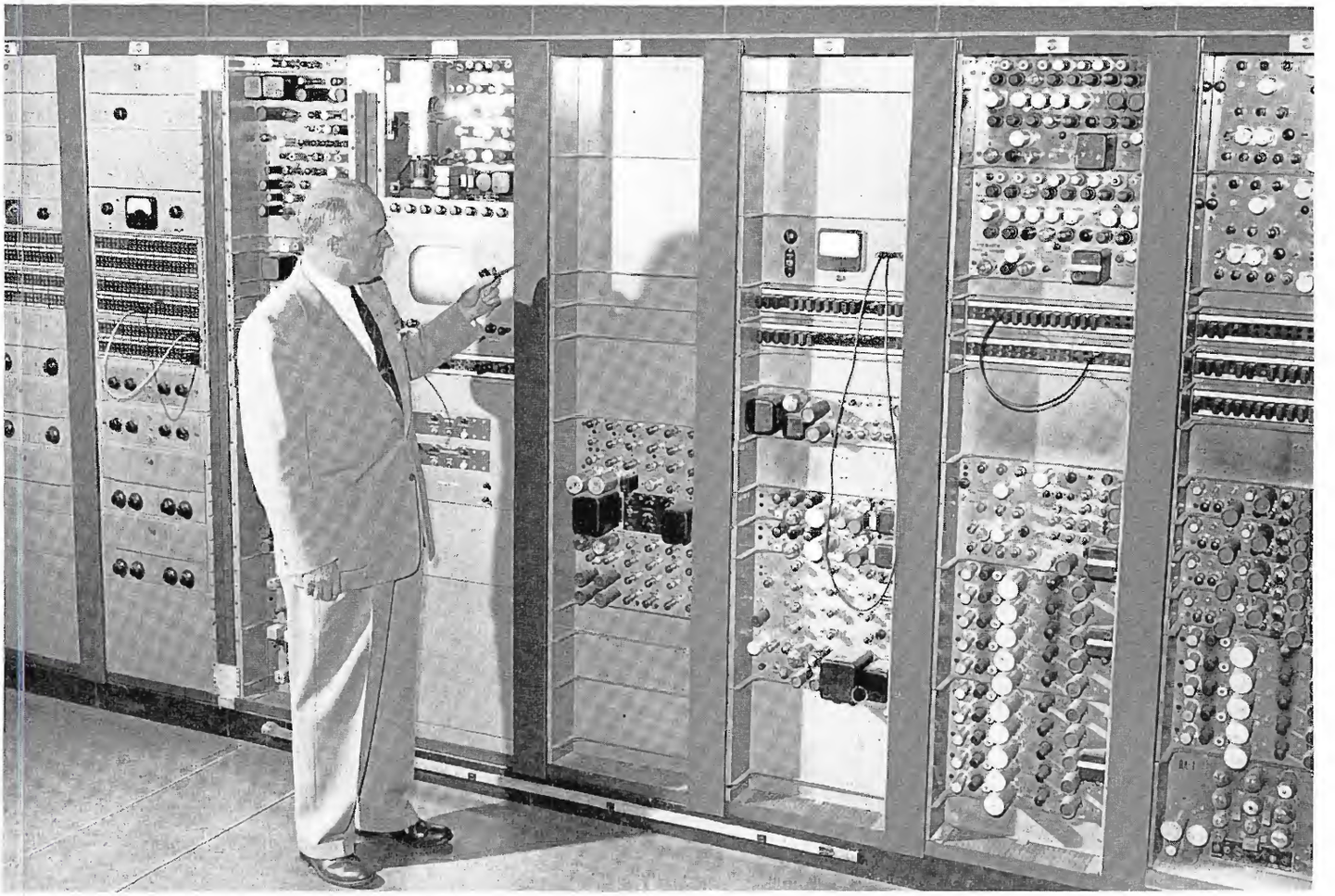


FIG. 25. E. J. Love, General Engineering Manager, indicates rack space that has been provided in MCR for future possible additional 3-V system.

FIG. 23. Studio "X" is handled by Walt Runkel, MCR technical director and Ned May, audio operator.

Studio "X"

All film-camera outputs appear on master monitors in the Studio "X" control console—these include the 3-V film chain and the iconoscope film cameras. The 3-V output appears in both black and white and color—hence a color monitor is situated directly above the processing amplifier at the left-hand side of the console. Two additional master monitors are provided for studio/line and previewing. Gain and pedestal controls for all the film cameras are located in front of the MCR technical director in Studio "X". A TS-20 relay switcher panel enables the TD to handle video switching — noncomposite video being fed to the switcher from all studios. Two 24-dc power supplies with automatic change-overs are provided for the d-c relays in the TS-20 remote control switching system. To date there have been no failures. Late hour program material, such as network or film, can also be handled at the Studio "X" console.

Intercom and additional ringdown facilities control for remotes are also provided. It is possible for the Studio "X" announcer to override any or all of the four outgoing audio channels. In control of this function at WWJ is the audio operator at the Studio "X" audio consolette. Five mixer positions are provided on this consolette. A utility position at the extreme left may be used for any studio, remote or network. Mixer positions are also provided for the announce booth and film sound. The remaining two mixer positions are used for the 70-D turntables.

Power Supplies and Wiring

A total of 90 ft of relay racks in five banks are located in the MCR area. An isolated power supply arrangement is used here—an entire bank consisting of eight relay racks being devoted just to power supplies. This bank is on a separate master breaker system. All power comes into the racks overhead, keeping audio and video lines isolated from the power lines.

Dirt and heat factors decided the station on air-conditioning. As a result tube life has been extended by anywhere from 300 to 400 per cent. This represents a considerable saving in a plant that uses a total of approximately 6,000 tubes in its equipment. Now, a replacement figure of nearly 200 tubes a month is average.

All of the equipment bays in master control are exhausted out the top by convection, with the exception of the power supply bank which uses an exhaust fan to

FIG. 26. Cable shaft in WWJ studio building runs vertically the entire height of building—all interfloor cabling is run through this 3 by 10 ft shaft.

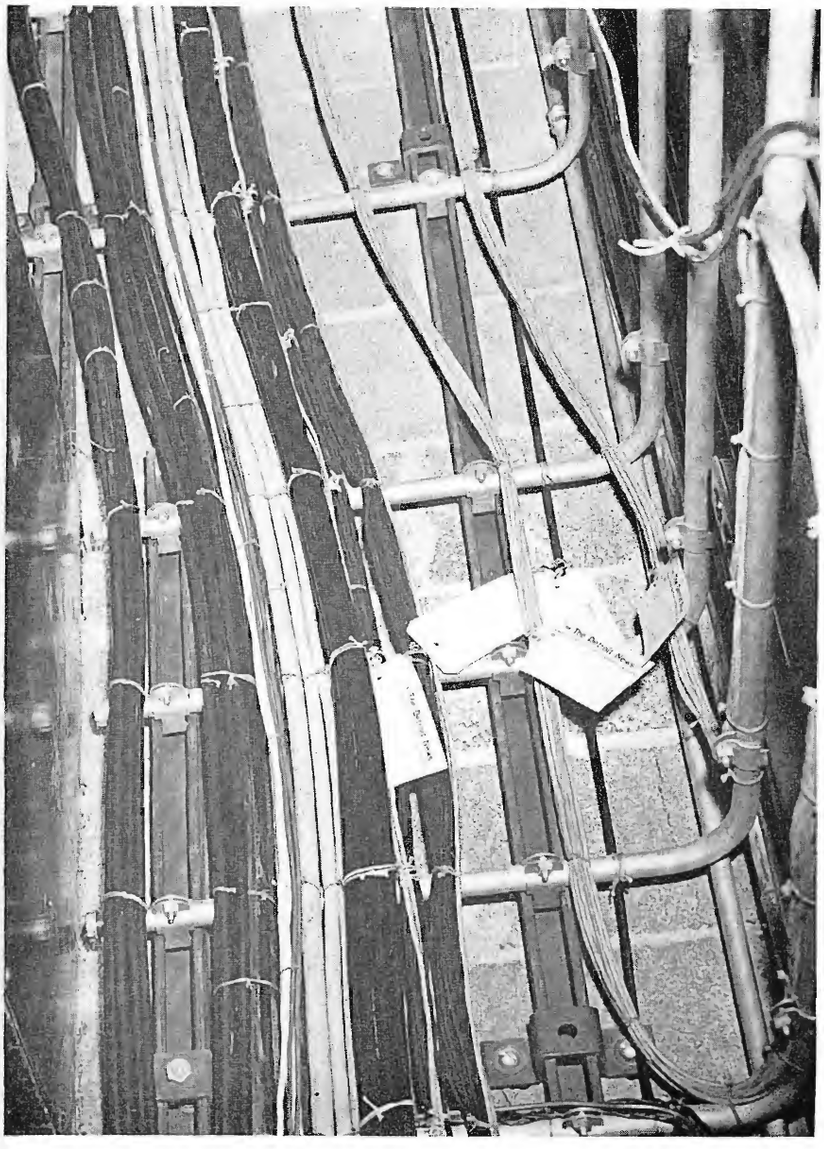


FIG. 27. Master control area containing a total of five banks of equipment racks. Workshop area is located in the far background.

remove air from the entire bank. The exhaust air is then cooled and filtered by the air-conditioning system.

Patching at WWJ-TV is kept to an absolute minimum. "It is axiomatic," according to A. G. Sanderson, Facilities Chief, "that a well engineered system uses a minimum of patching." Video and synchronizing circuits are patched only when testing or when by-passing is required.

All interfloor cabling is brought into a 3 by 10 ft shaft. Cable trenches then carry the cable and wiring on each floor to the various studios and control rooms. Uni-Strut piping is used for cable lashing and all cable and wiring in the shaft is tagged for easy identification. Steel gratings at each floor level permit maintenance work to be performed. Power lines are run in conduit both as a means for protection and for isolation. Boiler plate covers the top of the shaft, since the whole building has been designed with a view towards future expansion (adding two entire floors).

In the MCR area and right next to the cable shaft is a main terminal frame. Here all wiring, except coax, is brought in for maximum plant flexibility. Two 50-pair cables and a 26-pair cable for d-c control circuits terminate here from all three studios.

Building Layout

At the back of the building on the first floor, garage space has been provided to house WWJ-TV's mobile unit and associated equipment. Along the front of the building are the offices of the TV station manager and the sales department as well as a large conference room.

The entire first floor of the building has been planned so as to give direct passage for talent from rehearsal and properties rooms downstairs to the studios. Another passage gives the engineers easy access from MCR upstairs to each studio control room.

At the far end of M/C is an engineering workshop of 660 sq ft separated from M/C proper by relay racks containing an "Antenaplex" system for closed circuit distribution of TV broadcast signals. The remainder of the second floor level consists of engineering offices.

The lower level of the building has been designed around a central storage area for television properties—an area measuring 64 by 88 ft. Space has also been provided for a rehearsal studio with adjoining dressing rooms. A film library and a news room are also located in the lower level, while another section contains the refrigeration equipment for the air-conditioning system and the electrical equipment which provides primary power for the entire AM and TV operations.

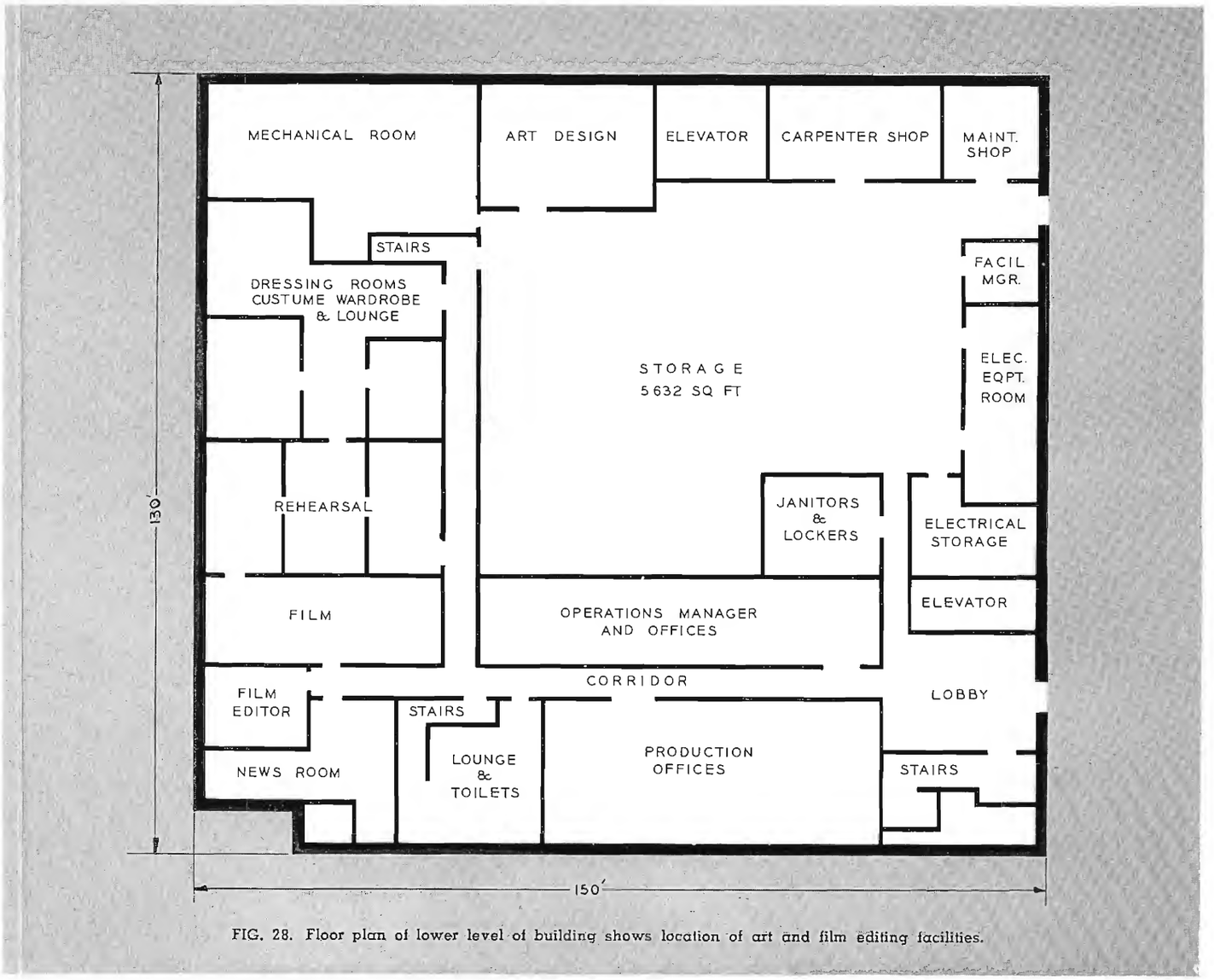


FIG. 28. Floor plan of lower level of building shows location of art and film editing facilities.

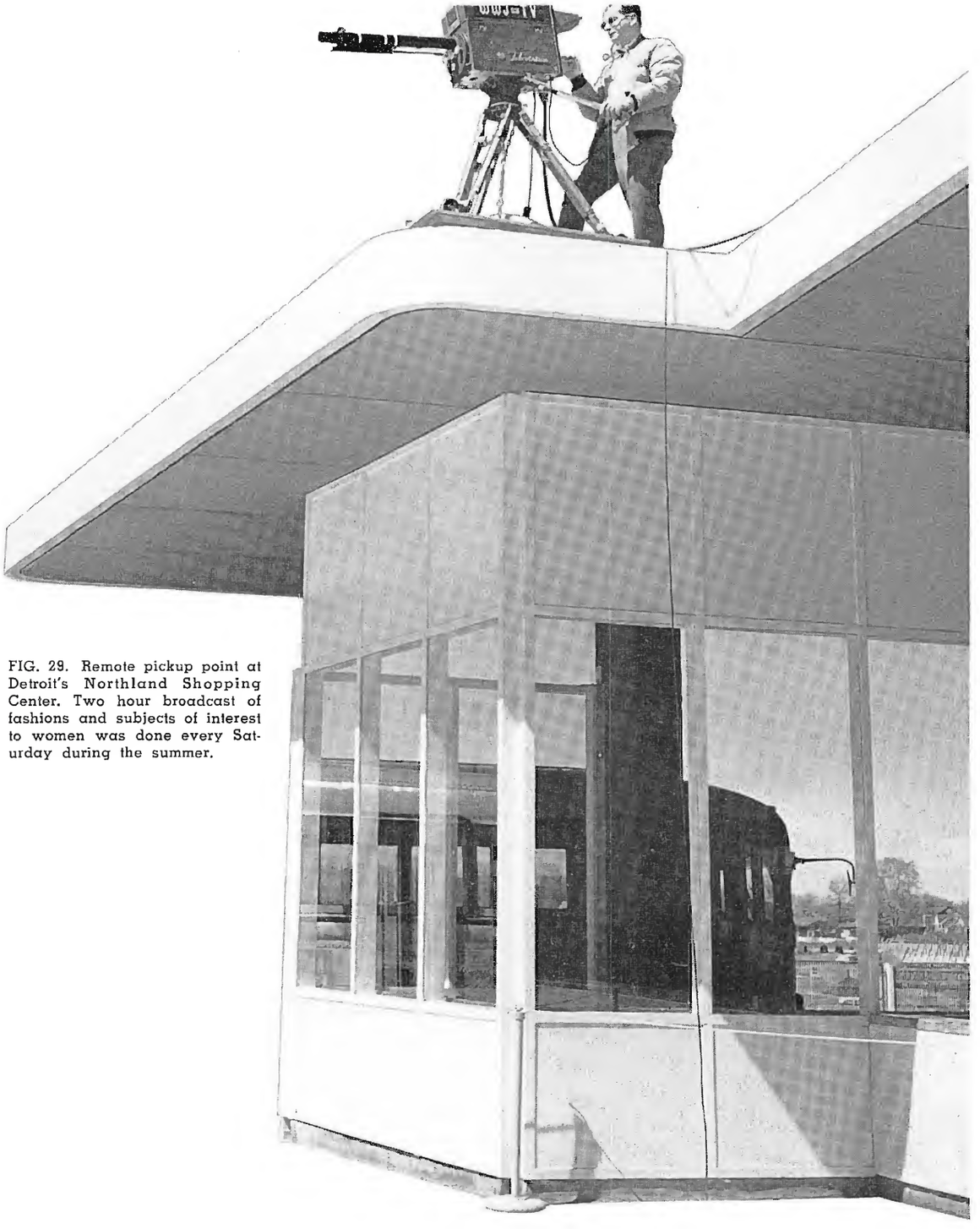


FIG. 29. Remote pickup point at Detroit's Northland Shopping Center. Two hour broadcast of fashions and subjects of interest to women was done every Saturday during the summer.

Mobile Unit

Remote pickups are handled using a 25-ft television mobile unit, custom built under the direction of Olin Lapham, Studio Supervisor. Three field cameras comprise the live TV pickup gear in the 13,000-lb remote truck.

One remote handled on a regular basis every Saturday during the summer is a 2-hour pickup from Detroit's fabulous Northland Shopping Center. Here fashions and other topics of interest to women are picked up and beamed via an RCA TTR-1 microwave transmitter to the transmitter site 1½ miles away. A remote controlled mount is used for the microwave dish. Switching facilities are available at the WWJ transmitter site.

Cable runs of 250, 400 and 850 ft are used to give the necessary flexibility during programming. A TS-30 field switching system permits fades, superpositions, dissolves or instantaneous switching between the three RCA field cameras.

Audio control is provided by a four-channel audio consolette with an auxiliary mike cut-over box. Two microphone inputs fed through the mike cut-over box allow the audio man to cut from one mike to the other at will.

Color Operations

The entire system at WWJ-TV has been modified, integrated and checked out for color. The station has been working with color since October 1955 when they con-

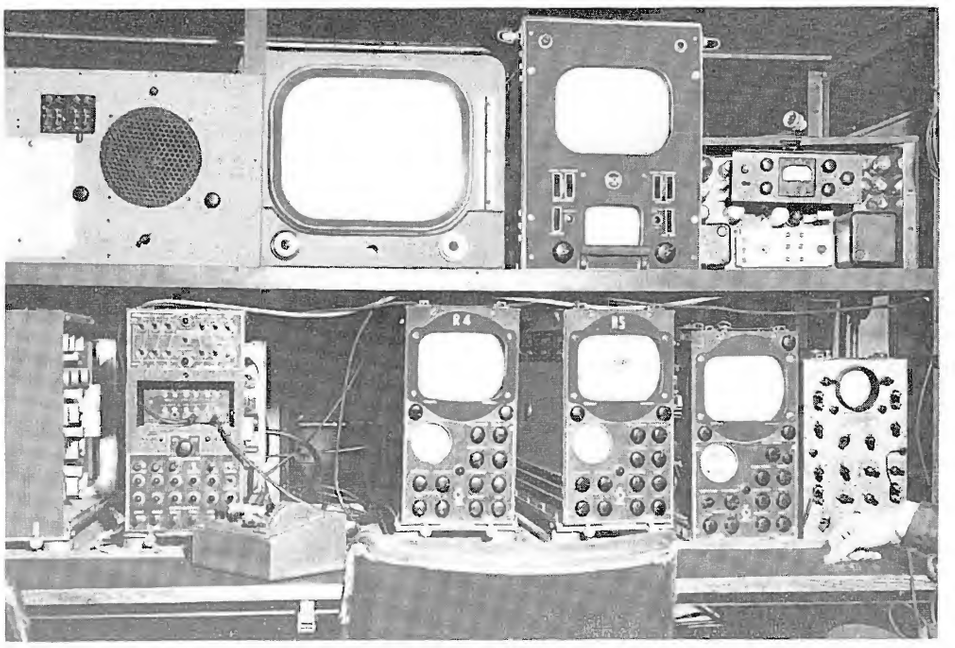
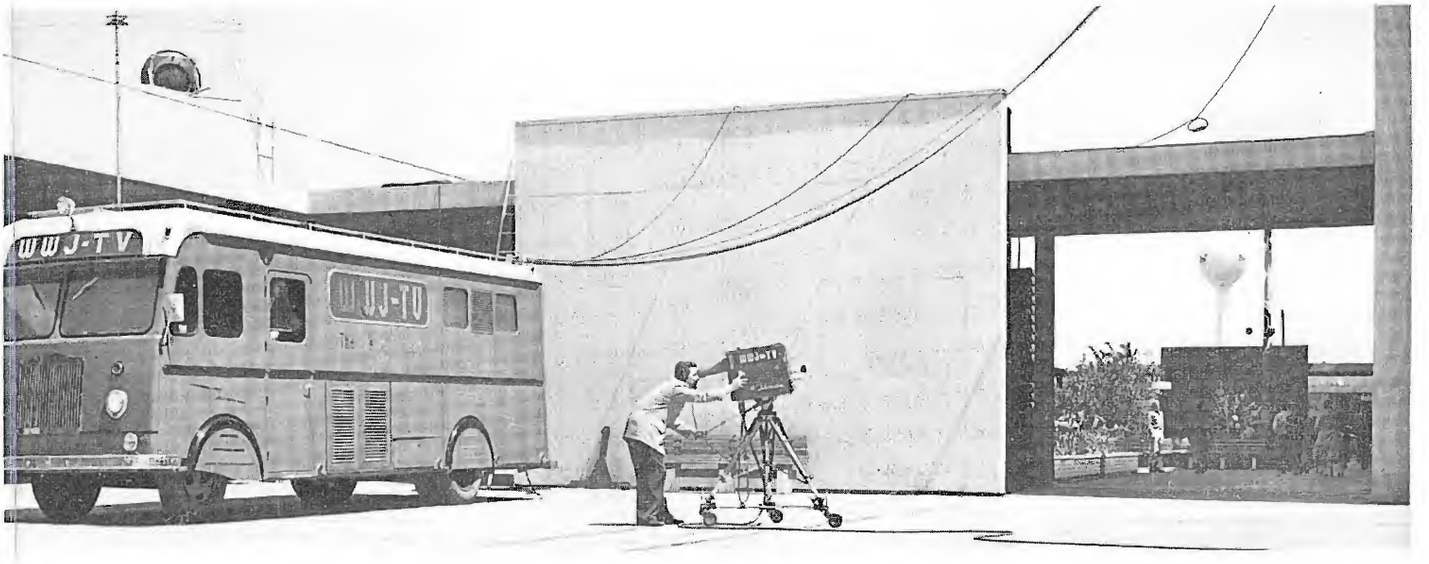


FIG. 30. Interior view of the WWJ television mobile unit. TS-30 field switcher provides flexible control of the three RCA field cameras.

FIG. 31. On location at Northland Shopping Center remote. Microwave dish at upper left has remotely controlled mount.



ducted a seminar for their production and engineering personnel in preparation for the installation of their 3-V system. The next step is local live color. As far as facilities are concerned, all that is required for live color programming is the installation of live color camera chains.

Probably unique in broadcast operations are the two separate pulse-distribution systems in use at WWJ. Non-synchronous operation of the TV system is a must in color since the color signal frequency is controlled by a crystal setting in the sync generator. Present black-and-white TV operating standards provide that the system be tied in with the 60 cycle power line. Since WWJ had brand new iconoscope film camera chains, they felt that use had to be made of them—as a result, separate pulse distribution systems.

At the present time approximately 20 per cent of the artwork produced at WWJ-TV is being done in color. To satisfy the demands of the 3-V system for color material a great deal of use is made of magazine and calendar color art. Printed matter is then inserted on these pictures when and where needed.

In preparation for live color programming the art department is building up data on color reproduction values on the grey scale. A luminosity chart which plots relative response versus wavelength, is being used as a general guide so that colors can be selected with a view towards adequate grey-scale separation. There must be no degradation of picture quality and contrast on black-and-white receivers as a result of going to local live color programming.

January 1st, 1954, saw WWJ-TV telecast the first network color program in the Detroit area, the Tournament of Roses Parade from Pasadena, California. On October 9th, 1955, WWJ-TV gave viewers the first local color television in the State of Michigan. On that day, the station transmitted over four hours of station-originated film and slide features. Colorcasts have been on the regular schedule ever since. Future plans according to Mr. Edwin K. Wheeler, General Manager, call for local news coverage and a growing number of other programs in color video.

PROGRESSIVE WHLM AM-FM KEYNOTES QUALITY OPERATION

Started as a Community Project . . .

Grows to Enterprising Independent

FIG. 1. "WHLM predicts the weather" via a large neon sign on the roof of the downtown studio building. Bloomsburg, a farm area, appreciates this service.

Radio listeners in North Central Pennsylvania are served by one of the nation's most forward-looking radio stations, WHLM, owned and operated by Harry L. Magee. Located in Bloomsburg, the station serves an audience of over 150,000 people in Columbus, Montour, Northumberland, Luzerne and adjoining counties. The area is one of Pennsylvania's richest agricultural and manufacturing districts. WHLM was planned and sponsored by Mr. Magee, owner of the well-known Magee Carpet Mills, as a community project, but it has been a notable financial success as well, almost from the first. The station began operating with the call letters WLTR in January, 1948, on a frequency of 690 kc and a power of 1,000 watts using two towers, daytime. In September, 1952, the call was changed to WHLM. In December, 1953, WHLM switched to 550 kc, with 500 watts and a four tower array on day/night operation.

From the beginning, a balanced program fare of news, music and sports built a loyal listening audience. Particular attention is paid in planning the programs to provide both entertainment and public service features.

News programs are featured on WHLM. In addition to a local news reporter, the station obtains regional reporting service from the news wires of both Associated and United Press. The station staff members are proud of several important news "beats" which were first reported on WHLM.

FIG. 2. One of the spacious, tastefully decorated WHLM studios. Large enough to accommodate a reasonable-size audience. The studio's irregular shape prevents multiple reflections . . . improves acoustics.

Studios

The studios and station business offices are located on the second floor of a building in the center of Bloomsburg. This studio location was chosen both for the con-

FIG. 3. Ray Calabrese, veteran announcer, gives a newscast on the famous RCA-44BX microphone. In the background, Terry Abrams engineers the program at studio control.

venience of the station staff, artists, and for the convenience of the public, who are always welcome to visit the spacious, tastefully decorated studios. On the roof of the building the station has erected a large neon sign which shows the daily weather forecast and the current temperature. The townsfolk, a great percentage of whom are agricultural people, appreciate this WHLM forecast.

The main studio, although used primarily for news and special programs, is large enough to accommodate a small audience and the performing artists. The acoustic properties of the large studio were carefully controlled by the designers, and provide a pleasingly balanced sound whether or not an audience is present. Sound-absorbing material is used in such a manner as to cancel or reduce sounds reflected from the large windows and the doors. The studio shape is irregular rather than rectangular, thereby preventing multiple reflections from parallel walls.

Much of the program material originates from the control room, which has also been treated acoustically to provide balanced sound.

Regularly-Scheduled Remotes

The station has a number of regularly-scheduled remote broadcasts, both from Bloomsburg and from nearby cities. Local sports are emphasized, and every effort is made to present live broadcasts of all events of local or regional interest, such as the county and state fairs, parades, and the like. The station is also affiliated with the Phillies baseball network, and has carried major-league baseball since its first season on the air. Considerable use is made of tape recordings for delayed broadcasts, where two or more events occur simultaneously.

Transmitter Site

The transmitter building, constructed of concrete block, is located approximately 1½ miles from the center of Bloomsburg. Four Stainless 400-foot guyed towers comprise the directional antenna system, "beaming" the station's power in the direction of the major audience, increasing the effective signal strength in that direction to many times the value obtainable with a single antenna tower.

The selection of a suitable site was a considerable problem, due to the fact that

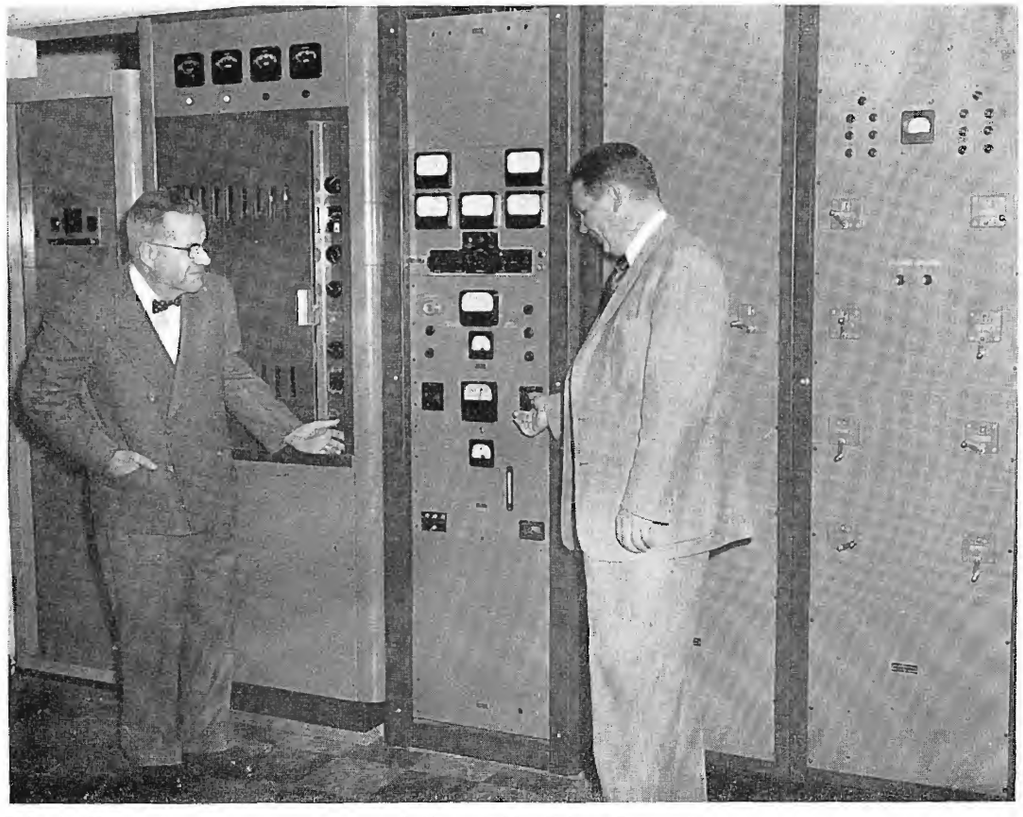


FIG. 4. Harry L. Magee, station owner (left), and Mr. Robert R. Williams, station manager, discuss transmitting equipment functions at the transmitter site. Transmitter is the RCA BTA-1M.

FIG. 5. The WHLM transmitter building lies in the valley between the second and third tower. It is constructed of concrete block and has more-than-adequate room for its AM and FM transmitting equipment.

FIG. 7. Four Stainless 400-ft guyed towers comprise the WHLM directional antenna system.

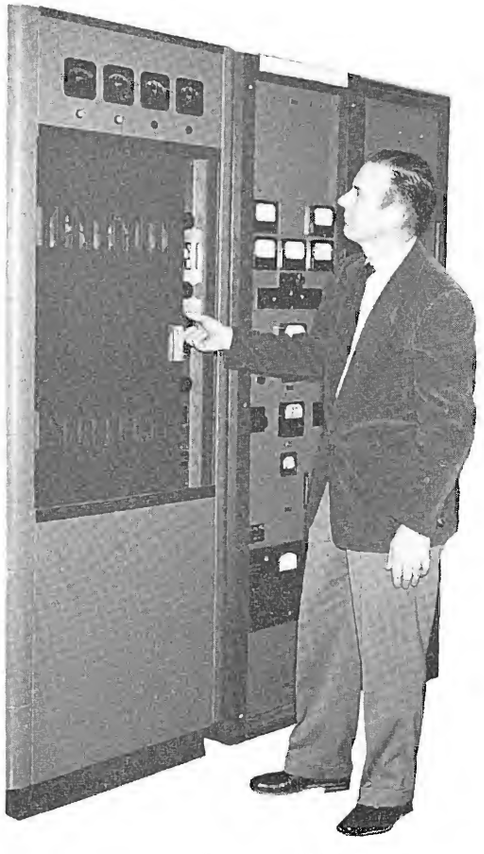


FIG. 6. Anthony F. Hogg, Chief Engineer, observes meter readings on the AM transmitter. Mr. Hogg keeps station operating at peak efficiency as proved by a recent nationwide Conelrad alert. WHLM, key Conelrad station in Bloomsburg area, made switch from 550 to 640 kc in 30 seconds.

the four towers are in a straight line and are spaced approximately 500-feet apart. In the rolling hills which surround Bloomsburg it was not easy to locate a level space of this size which was otherwise suitable. It was, in fact, necessary to place one of the four towers on an embankment opposite the entrance to the transmitter building, and a county road runs between this tower and the next in line. According to Anthony F. Hogg, WHLM chief engineer, the site has proved satisfactory in every respect.

The lower level of the transmitter building, which opens onto the county road, provides garage space for WHLM's station wagon and special-events car. Also on this level are two 10,000 watt a-c generators which provide emergency power.

On the upper level are the engineering office, the operating area, the RCA BTA-1M transmitter and associated equipment, a stand-by transmitter, and the workshop. A control desk, placed conveniently in front of the equipment, permits the operator to maintain constant supervision of the transmitter and phasing equipment. In addition to these facilities, a small studio is kept in readiness at the transmitter site, and may be used should the telephone lines from the studio become inoperative.

WHLM is the key Conelrad station for the rich Susquehanna Valley area. During a recent nationwide alert, WHLM demonstrated the efficiency of their operation—making the Conelrad transition from 550 to 640 kc in 30 seconds.

FM Service, Too

In line with its continuing policy of public service, WHLM is now in the process of installing an RCA BTF-3B 3 KW FM transmitter atop a hill near the AM transmitter site. The FM programs will originate from a second studio and control room to be added to the present studio facilities, and will be programmed separately. The FM antenna will be mounted atop a 400-foot tower on the hilltop, and will be approximately 1,000 feet above the average terrain. It is expected that excellent FM program service will be available to listeners within a 75-mile radius of Bloomsburg. The FM transmitter will be unattended, and will be controlled by means of an RCA BTR-5F Remote Control unit, permitting the engineer on duty at the AM transmitter building to maintain supervision of the FM equipment more than a mile away.

According to Harry L. Magee, the station owner, future prospects for WHLM are excellent. The area is growing and prospering. There is every indication that WHLM's policy of offering excellent entertainment and public service will continue to build both an increasing and a loyal audience.

WFIL-TV PROGRAMS LOCAL LIVE COLOR

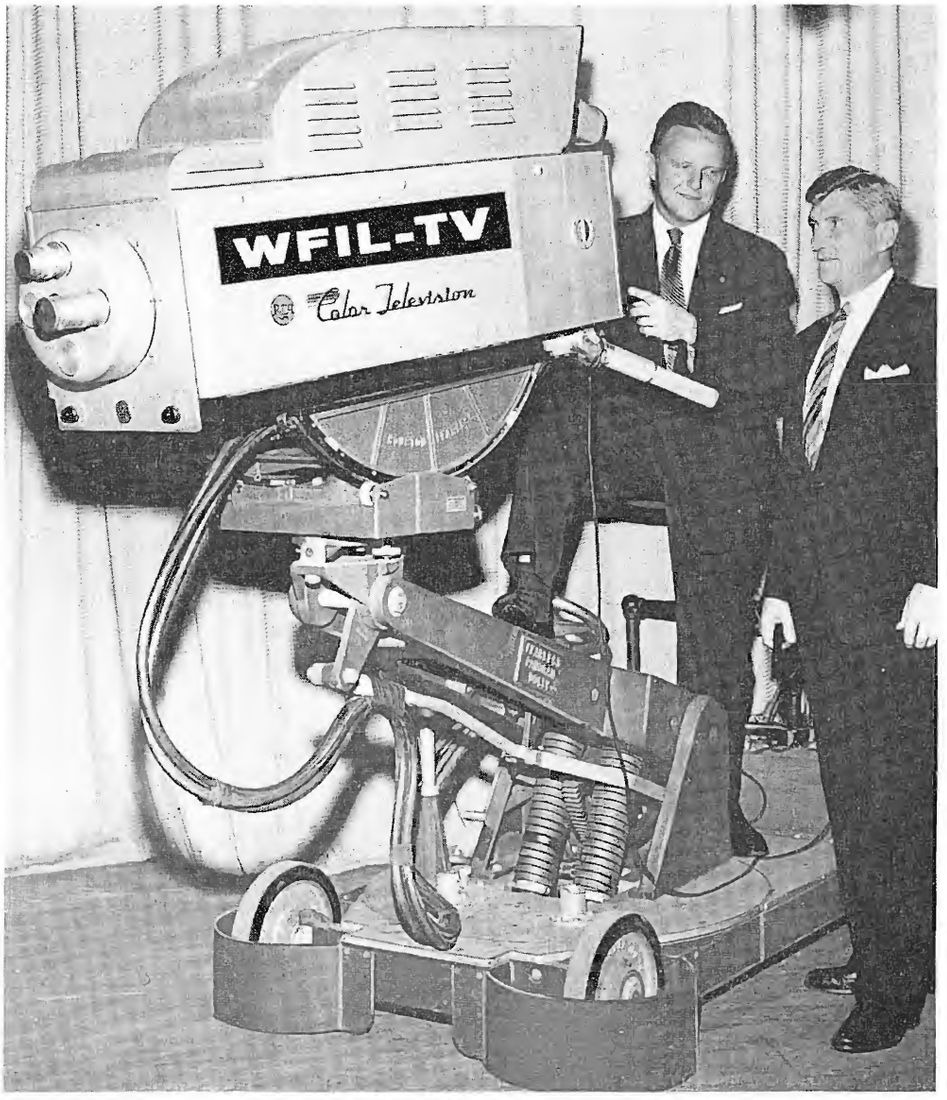
On July 23rd, WFIL-TV startled the Philadelphia area by announcing the inception of regularly scheduled colorcasts, thus becoming the first Philadelphia station to present local live programs in color.

Color telecasting plans called for at least one local live color program each week. This schedule has now been expanded to include more than fifteen hours a week of local live color. The Channel 6 station is now doing one of its top shows, "Bandstand" in full color every day, Monday through Friday.

The move is bound to provide a strong stimulus on the growth of color television in the area. With more than two and one-half hours of color coming their way each day, televiewers are given increased incentive to make the move to color.

Foresight and faith in the future of color television have led to the step to local live color. It is axiomatic that color will soon be big business. WFIL took the step to anticipate the big swing to color and to obtain the experience that will enable the station to take advantage of the opportunities offered by color.

Although the station's intention to start regularly scheduled color programming was a highly guarded secret, station technicians were fully prepared for the change over. For several months prior to the start of live color programming, operating personnel had been briefed on the operation of the new equipment. Closed circuit demonstrations provided full opportunity to study the problems associated with the change. As a result, the first show was very successful and unmarred by unexpected technical or production problems.



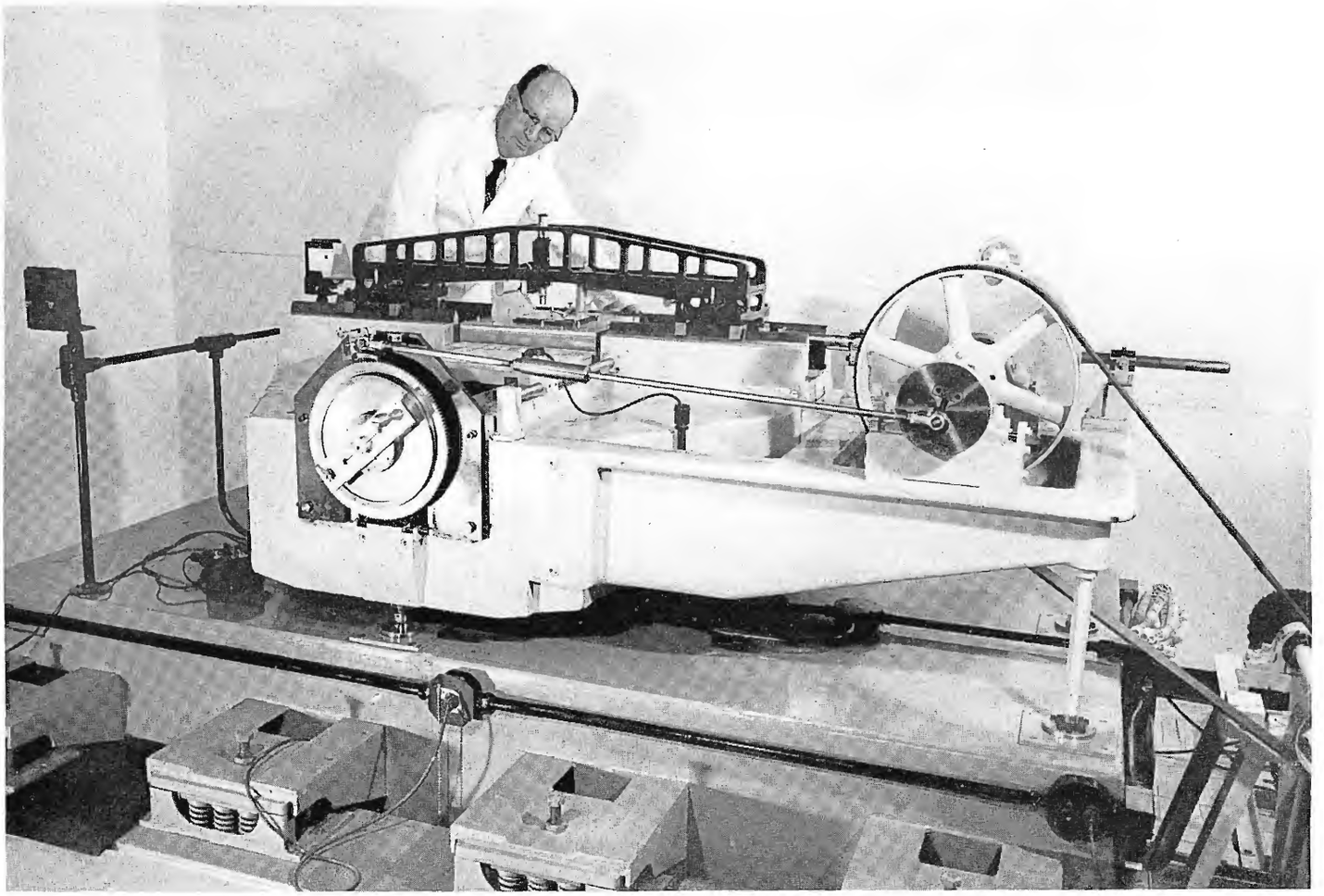
George A. Koehler, WFIL-TV station manager (left), and Henry E. Rhea, chief engineer are shown with their newly acquired TK-41 Live Color Camera Chain.

The big emphasis in the months prior to live color telecasting was on lighting. As the color medium became more familiar two things became apparent. Lighting had to be much more uniform and more of it was required for color. For the "Bandstand" show a lighting level of 300 foot candles is used as contrasted with the 70 foot candles required for this same program in black and white.

For the past four years WFIL has been making lavish use of color in sets and scenery. Their program people feel that color has a positive and desirable effect on performers. Thus, when live color became a reality, the station found itself in the fortunate position of not having to make any changes in the "Bandstand" set.

As other color shows come up, the station feels that it will probably have to do some testing on grey scale rendition of various colors to assure adequate contrast on black-and-white receivers. With over one million black-and-white receivers in the Philadelphia area, no compromise with quality of black and white reception can be tolerated.

Since announcement of the move was withheld until shortly before air time, the opportunity for viewer reaction was of necessity limited. However, a surprisingly large number of calls were received by WFIL asking for confirmation of the color move. One delighted appliance dealer reported that a large crowd had gathered in his store as word of the live color program spread throughout the area.



John D. Herrington, foreman in charge of mesh master development is shown at the ruling engine developed at Lancaster.

RCA NOW USING 750-MESH SCREEN IN TV CAMERA TUBES

Two improved image orthicon television camera tubes—the RCA-5820 for black and white and the RCA-6474 for three-tube color cameras—are now being quantity produced for the broadcasting industry with Micro-Mesh, a 750-line per inch mesh screen, replacing the 500-mesh screen heretofore standard in both tube types.

The 750 mesh eliminates all traces of bothersome noise patterns. Although mesh up to 1,000 lines per inch has been produced by RCA, requirements of the present 525-line television system are exceeded with camera tubes employing the new 750 mesh. Laboratory and field tests have shown that mesh of 750 lines per inch is more than adequate.

To achieve the goal of a 750-mesh screen, it was necessary for RCA to develop its own mesh-making techniques and equipment. Included in the work was the design of an amazingly accurate ruling engine to produce the "master" matrices from which the gossamer-like screen can be produced in quantity.

These meshes are made by an electrodeposition process, using grooves ruled in a glass master as a form. An acid-resistant wax coating is first applied to optically flat glass. Using a suitably shaped stylus or tool, the wax is then ruled with perpendicular sets of parallel lines. When the ruling has been completed, the glass is etched, cleaned and covered with a thin metallic layer using a sputtering process. The surface layer is then removed by rubbing with a plastic material. This leaves only the metal in the etched grooves. An electroplating process forms the mesh which is then removed from the glass master.

Obviously, the ruling of the mesh master is a critical step in mesh manufacture and is accomplished using the new ruling engine. Operation of the ruling engine involves the shuttling motion of a diamond stylus moving back and forth on lubricated crossways. As the stylus shuttles back and forth, it presses very lightly on the glass mesh master. The stylus cuts only in one direction, lifting when a cutting stroke has been completed and returning for the next stroke. A lead screw moves the glass mesh master the required distance laterally during the return stroke. The width, depth, contour and spacing of these ruled lines must meet very exacting requirements to insure that each line will be identical with the next.

So fine is the grid forming the mesh that the minute openings represent more than 60 per cent of the total area of the screen. It is through these openings that electrons must pass to reach the vital "target" of the image orthicon and create the television signal.

WRC-TV FIRST STATION DESIGNED SPECIFICALLY FOR COLOR TV

The nation's first television station designed and constructed "from the ground up" specifically for local and network color programming will soon be built by the National Broadcasting Company in Washington, D. C., for its owned and operated stations WRC and WRC-TV.

Approval by the NBC Board of Directors of the new station's plan was recently announced by Robert W. Sarnoff, President of NBC. Completion of the plant is scheduled for the Fall of 1957. The cost of the new plant will be approximately four million dollars.

These new facilities will make it possible to show to the whole nation, in living color, the events, personalities and scenes of our Capital City. They will also provide Washington audiences with an exceptional local color programming schedule to supplement network color service.

Carleton D. Smith, NBC Vice President and General Manager of WRC and WRC-TV, pointed out that the new plant, representing the last word in RCA electronic engineering, will have outstanding significance to "official Washington." Members of the Cabinet, members of Congress and other government dignitaries, will be able to participate directly in the new TV era by appearances before WRC color cameras.

With the start of operations in the new plant, the majority of all local live programs will be telecast in color. The plant will be equipped to expand the schedule as rapidly as local interest in color develops. Color will have a powerful impact upon the advertisers and consumers in our nation's capital, which is the ninth largest retail market in America.

The site for the new WRC, WRC-TV building is a seven-acre tract on Nebraska Avenue in Northwest Washington, located near Ward Circle Avenue, adjacent to the Naval Communications Center. The ground level at the point is 385 feet elevation. The top of the WRC-TV antenna will be 849 feet above sea level, making it the highest structure in Washington.

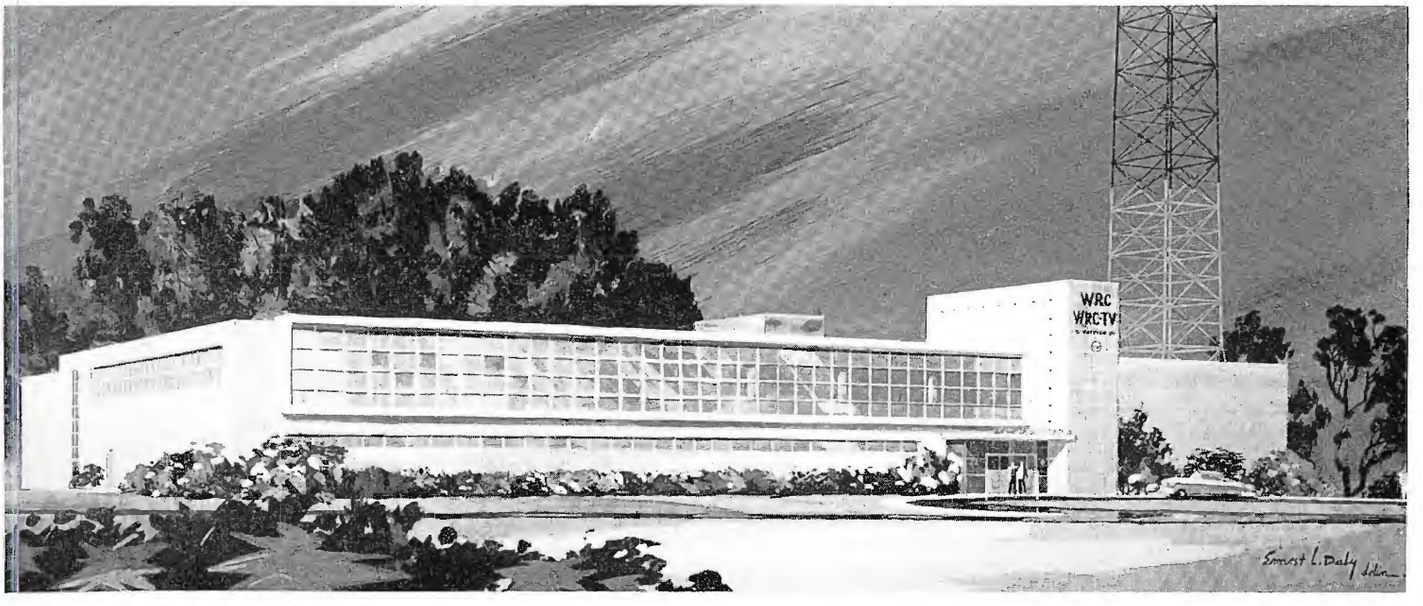
The exterior of the rectangular two-story broadcast center will be contemporary in style, consisting of gray modular brick, limestone and colored porcelain enamel. Because of the sloping topography the basement will be entirely above ground at the rear of the building where landscaping will provide areas for programs requiring an outdoor setting. The seven-acre tract will include room for parking 150 cars.

The building plans call for three television studios, 60 by 100 feet, 60 by 40 feet, and a small TV-commercial studio. Control and viewing rooms, and service and set assembly areas are located immediately adjacent to the studios. The two large studios are accessible by truck and auto for ease in handling equipment, sets and large advertising displays. Carpenter and paint shops are also nearby.

First floor offices provide accommodations for news editors and commentators, producers, directors, and traffic and program departments. Also on the first floor level are a kitchen and employees' dining room. The second floor will contain the executive and sales offices.

In the basement there will be three radio studios, rehearsal and recording rooms, announce booths, the small TV-commercial studio, and TV and radio technical areas. Also to be included are engineering offices and shops, talent lounges and dressings rooms, and a garage.

The interior of the new building will be modern in all respects, employing materials chosen for efficiency, attractiveness and ease of maintenance. The marble and glass lobby will feature show windows for the displaying of the latest RCA broadcast equipment. The entire building will be acoustically treated and equipped with fluorescent lighting. The power requirements of the building will exceed 2,000 kilowatts of electricity. The air conditioning system will be individually controlled in each one of the many studio and office spaces to be served.



Architects drawing of new WRC-TV plant to be located on a seven-acre tract in northwest Washington, D. C.

WRCV-TV NOW BROADCASTING IN COLOR

LIVE LOCAL PROGRAMS COLORCAST ON REGULAR BASIS

On September 24, WRCV-TV, NBC's owned station in Philadelphia began local, live color telecasting with the airing of the station's top local Monday-through-Friday programs. According to Lloyd E. Yoder, NBC Vice President and General Manager of WRCV and WRCV-TV, the station will telecast a total of 15 hours of local color programming per week.

WRCV-TV local shows colorcast on a Monday-through-Friday basis include the "Let Scott Do It" show, featuring Alan Scott and Mr. Rivets, the mechanical man, 9-10 a.m.; "Newsroom," 2:25-2:30 p.m., with Pat Landon reporting late local and world-wide headlines direct from the WRCV-TV newsroom; and Pete Boyle's popular 6:00-6:30 p.m., "Funhouse," featuring cartoons and film features for the kiddies. Channel 3's entire 11:00 to 11:30 p.m. strip of news, weather and sports may also be seen in color. Mr. Yoder, in announcing Channel 3's color lineup, said that weekend color-schedule plans were being formulated and would be announced in the near future.

Preparation for WRCV-TV's switch to color has been going on in the NBC building in downtown Philadelphia since early summer. Walls were torn down and new ones went up, new equipment was installed and tested, training periods for technical personnel were set up, and studios were modified for the station's extensive color programming.

The fifth floor of the WRCV-TV studios has been completely revamped, with a video-central set up. This video-central encompasses master control as well as individual studio controls and a color control room. One of the station's main studios has undergone a complete "colorization." This includes entirely new lighting which has increased the studio light intensity by at least three times its former value. The former Studio K has been converted into a training studio where all necessary instruction, rehearsal, etc., take place.

Equipment additions for conversion to color included two live color camera chains and a 3-V color film chain capable of projecting 16-mm color film, and 2 by 2 inch color slides, as well as having an opaque attachment. In order to accommodate this new color equipment, modifications and special construction throughout the building were necessary. By using the new RCA WP-15 regulated power supplies, a considerable saving in valuable rack space has been realized.

Channel 3's master control setup was modified to include eight color monitors. Two additional color monitors were installed in the master control while three units were placed in studios and three in the video color control room.

An entirely new projection room was constructed. It contains not only the 3-V color film chain, but also a staging area for live commercial presentations. There are, in addition, two modified and completely modern black-and-white chains.

All of the technical work at Channel 3 is under the direction and supervision of William A. Howard, Supervisor of Television Technical Operations for WRCV-TV. Mr. Howard has been with the NBC Engineering Department since 1946, having worked in Development and Staff Engineering in New York and served as supervisor of a Cleveland radio and television station. He has stayed close to the development of color television since its early days, having trained in New York as well as attending many of the RCA seminars.

The Philadelphia area is benefitting from an increasing variety of local live color programs as WRCV-TV's colorcasting schedule provides additional impetus to the nationwide swing to color.

FIG. 1. Bill Howard, WRCV Supervisor of Television Technical Operations (right) explains circuit details of new WRCV-TV color camera.

FIG. 2. Final check is made on 3-V color film chain multiplexer. An input for opaques has also been provided in this equipment.

Mr. W. Laurence Le Page (right), Chairman of the Board of the Metropolitan Philadelphia Radio and Television Corporation and Mr. Samuel Barbour, WHYY chief engineer, examine a newly acquired image orthicon studio camera.

WHYY - PHILADELPHIA'S FIRST EDUCATIONAL TV STATION

INSTALLATION OF RCA UHF BROADCAST EQUIPMENT NEARLY COMPLETED

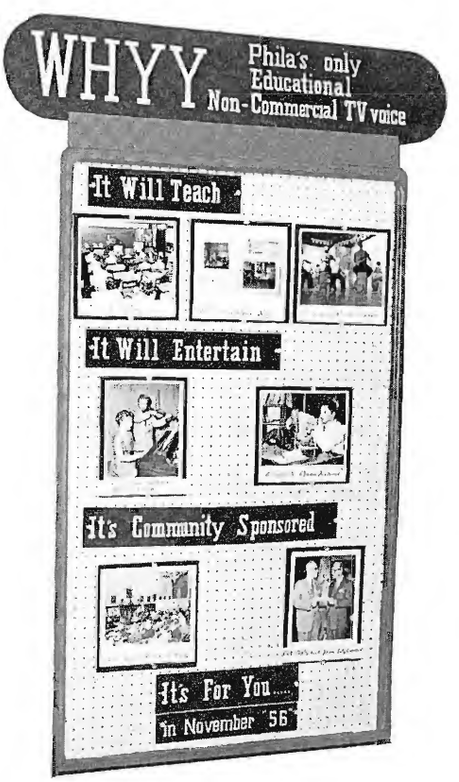
The first community-sponsored educational television station in Philadelphia, Pa., will soon make its on-air debut. The installation is being rushed to enable the non-commercial UHF station to initiate television service with cultural and instructional telecasts by late Autumn, according to W. Laurence LePage, Chairman of the Board of the Metropolitan Philadelphia Radio and Television Corporation, which will operate the channel-35 station.

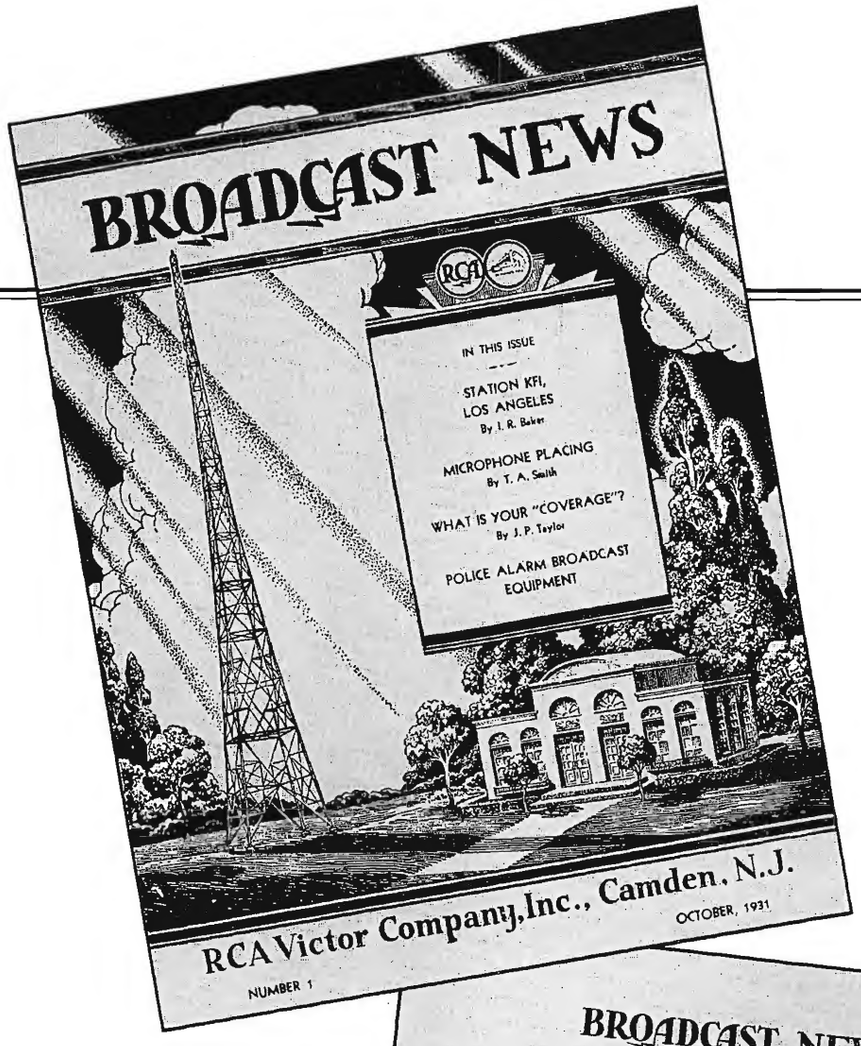
The installation involves more than $300,000 of RCA UHF broadcast equipment. Included are a 12½ kilowatt UHF television transmitter, a transmitting antenna, three monochrome image-orthicon studio cameras, a monochrome film-camera system, a kinescope photorecorder, and associated power, switching and control equipment.

The RCA transmitter-antenna combination will enable station WHYY to go on the air with an effective radiated power ample for primary broadcast coverage throughout a 25-mile radial area from its center-city studios in Philadelphia. The broadcast area represents 10 counties surrounding the Quaker City.

The non-commercial community station is supported by the City of Philadelphia, the Philadelphia Board of Education, local colleges and schools, business organizations and individual donors. It is the first new television station in Philadelphia in more than eight years.

In addition to augmenting the Philadelphia Board of Education's television programs transmitted into classrooms for in-school use, Station WHYY plans to originate adult education courses, children's programs for out-of-school hours, public affairs programs to interpret community services and activities, cultural and instructional programs and local special events.





Cover of the first issue of BROADCAST NEWS, which was mailed in mid-October 1931 to the engineers and managers of the 700-odd stations then on the air.

Title page of the first issue expressed hope that BROADCAST NEWS would "provide a pleasant and convenient medium for the exchange of ideas and information".

25 YEARS OF BROADCAST NEWS

Established to Provide Equipment Information for Station Engineers, BROADCAST NEWS Has Recorded the Technical Progress of the Broadcasting Industry Through a Quarter of a Century

by JOHN P. TAYLOR *Manager, Advertising and Promotion, Commercial Electronic Products*

BROADCAST NEWS Number One, the cover and title page of which are reproduced on the opposite page, appeared in mid-October 1931. Since that date BROADCAST NEWS has been published continuously (and regularly, except for the war years) by the Broadcast Equipment Department of RCA. In this 25-year period BROADCAST NEWS has grown with the industry—from 12 pages in the first to 72 pages in the present issue. And, like the industry, its interests have broadened to include FM, television, UHF, and now color television. However, during the whole quarter century there have been only minor changes in format, and no changes at all in editorial policy.

BROADCAST NEWS was started to provide a means of bringing information on RCA equipment, its uses, its advantages and its operation, to the broadcast station engineers who are RCA's customers. That was, and still is, the primary purpose of this publication. However, it was recognized from the first that the magazine could at the same time serve the broader purpose of providing (as was noted on the title page of the first issue) "a pleasant and convenient medium for the exchange of ideas and information" among broadcast engineers everywhere. To this end the articles printed in BROADCAST NEWS have not been limited to those authored by RCA personnel but, from the first, have included articles by station engineers, consultants and others. Moreover, the subjects discussed have included many other than those directly related to RCA equipment. The happy result is a publication which serves our engineer-customers (by helping them in their work) while at the same time serving us by publicizing our products.

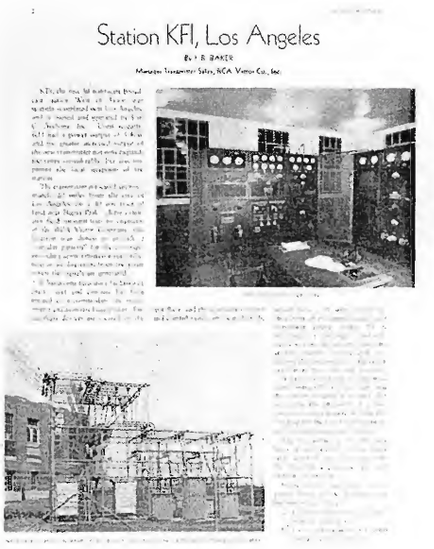
As a result of this policy, broadcast engineers early accepted BROADCAST NEWS as an ally in their work, and have supported it not only with letters of approval but, more importantly, by contributing to its pages. Other members of the industry —including some of the best-known consultants and designers—have done likewise.

The subject matter, over the years, has touched almost everything of interest to station engineers. Only one limitation has been imposed. It was early decided that BROADCAST NEWS was properly concerned *only* with broadcast equipment design, installation and operation. While broadcast engineers certainly have other—and wider —interests, it was felt that these were adequately covered in general magazines. On the other hand, broadcast equipment per se, received relatively little attention in the radio journals existing in 1931. And even today, there is no magazine which devotes a major part of its content to the technical side of broadcasting. The reason, of course, is that the field is too specialized and too limited to support a paid-circulation magazine devoted exclusively to the field. BROADCAST NEWS, at least to a degree, fills the gap. By strictly limiting its coverage to the subject, it is able to print far more information on broadcast equipment than can be found anywhere else.

During its twenty-five years BROADCAST NEWS has had four editors, numerous assistant editors, and literally scores of editorial advisors and consultants. Many of these have lavished on it time and effort far beyond the possible return in either pay or glory. Were BROADCAST NEWS a private publication, this twenty-fifth anniversary issue would nostalgically note their names and credits. But BROADCAST NEWS is not a personal organ—rather it is the symbol of a very special business—the broadcast equipment business of the Radio Corporation of America. Thus the important thing in its twenty-five year history is not the names of the many individuals who contributed to it, but—almost contrariwise—the fact that despite individual comings and goings, depression and boom, freeze and unfreeze, war and near-war, it has held steadfastly to a policy set down a quarter of a century ago.

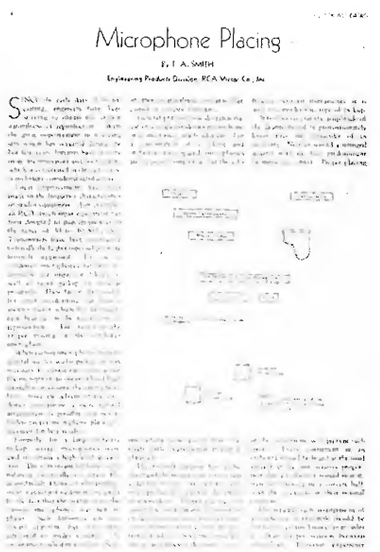
In doing so it has reflected the continuity, the stability, the foresight of the RCA Broadcast Equipment Department. Only for this reason is the twenty-fifth anniversary of BROADCAST NEWS important.

On following pages are reproduced the lead pages of some of the articles which have appeared in BROADCAST NEWS over the years. Many of these mark milestones in broadcast equipment development. Some were described for the first time in BROADCAST NEWS. Together these pages form a sort of capsule history of the technical progress in our industry. BROADCAST NEWS is proud of the fact that in bringing these articles to broadcast engineers the world over, it has served the industry as well as RCA.


Station KFI, Los Angeles

October 1931

FIRST 50 KW WEST OF TEXAS is the way KFI's then brand-new RCA 50B Transmitter was described in the lead article of the first issue of BROADCAST NEWS. Author was I. R. Baker, manager of RCA's transmitter business from 1930 'til his death in 1943. It was "Bake" who set the high standards by which RCA has built and sold broadcast equipment for 30 years. BROADCAST NEWS, too, was Bake's idea, and it was he who formulated its policy of "service to the industry".


Microphone Placing

October 1931

MICROPHONE TECHNIQUES were discussed in the second article of the very first issue. Microphone around which the article was written was the now long-departed (but not much regretted) condenser type. Simplified diagrams indicated placement of various musical instruments for best pickup balance. Author of this article was Ted Smith, then an RCA Broadcast Salesman, later manager of transmitter sales, and now Executive Vice President, Defense Electronic Products.


What Is Your "Coverage"?

October 1931

FIELD INTENSITY SURVEYS, which were just then coming into general acceptance, and which were still unfamiliar to most station engineers, were the subject of the third article of the first issue. Use of surveys in determining coverage and interference was briefly described as was the RCA TMV-21 Field Intensity Meter—first commercial instrument of its kind. Author was John P. Taylor, then sales engineer, now Advertising Manager, Commercial Electronic Products.


RCA Victor 100 250 Watt Broadcast Transmitter

April 1932

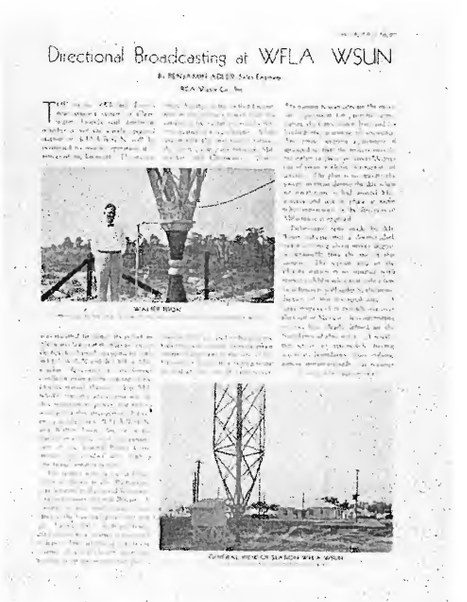
CLASS B MODULATION was used for the first time in a commercially-built broadcast transmitter in the RCA Type 100/250-w transmitter described in this article. This transmitter doubled the power amplifier efficiency of previous models. It was the first "250-watter"—a size which soon thereafter became, and has remained, the standard of the industry. Author of this article was W. L. (Larry) Lyndon—who for thirty years has been helping to develop and design RCA transmitters.


Police Alarm Broadcast News

GOING DOWN TO 5 METERS

July 1932

FIRST VHF EQUIPMENT produced for general commercial use was the RCA ET-5000 Transceiver described in this early article. Previous to this time all police radio was in the 1600 kc band. The ET-5000, designed specifically for municipal police use, established a trend which eventually led to the transfer of all 2-way radio services to the VHF bands. Development was considered of such interest it was included even though the subject was not strictly broadcast engineering.


Directional Broadcasting at WFLA WSUN

July 1932

DIRECTIONAL ANTENNA at WFLA-WSUN, subject of this article, was the first directive array used by a broadcast station. Suggested by Comm. T. A. M. Craven (then the station's consulting engineer) and designed by Raymond Wilmotte, it was installed under the direction of Walter Tison, station director. Bed Adler, who as RCA sales engineer in the area helped the station with equipment problems, wrote this article—one of the very first reports on the directional operation.


The Velocity Microphone

October 1932

THE RCA 44A VELOCITY MICROPHONE, progenitor of a long series of RCA high-quality microphones, and grand-daddy of today's widely-popular 44-BX, was described for the first time in this article by its inventor, Dr. H. F. Olson. Used for the first time in the "new" WCAU studios (which opened on Christmas Day 1932) it immediately swept the boards and has ever since been the most widely-used microphone in high-quality broadcast stations the world over.


Pioneer "Live-End, Dead-End" Studios

January 1933

LIVE-END, DEAD-END STUDIOS were first used on a station-wide scale by WNAC Boston in February 1932. This development in studio acoustics, together with the introduction of the velocity microphone late in the same year, resulted in a large improvement in the quality of sound pickup and led to establishment of new standards of audio quality. This BROADCAST NEWS article was written by Gordon Jones, then director of operations of WNAC and the Yankee Network.


WCAU A Modern Monument to the Art of Broadcasting

April 1933

NEW-TYPE STUDIOS, built by WCAU, Philadelphia, in 1932, started a trend in deluxe studio buildings. Designed specifically for broadcasting this building housed seven large studios each with its own independent control room. First with velocity microphones and other deluxe gear, it established a new standard. 14-page article by Jack Leitch was first "long" station story printed in BROADCAST NEWS. It set a pattern for picture-stories about outstanding new stations.


The Iconoscope
A Modern Version of the Electric Eye

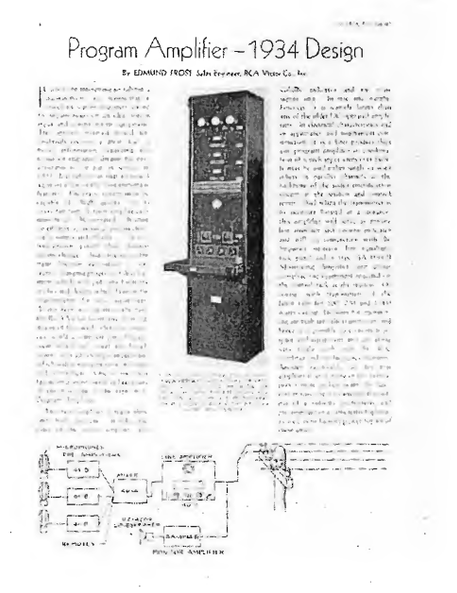
August 1933

THE ICONOSCOPE was described in detail for the first time in this paper by its inventor, Dr. V. K. Zworykin of RCA Laboratories. Prepared originally for the I.R.E. Proceedings (and reproduced by permission) this paper appeared as an article in BROADCAST NEWS some six months before it was published in the Proceedings. The iconoscope was the first true "electronic eye" and its development made possible the first all electronic television system,—developed by RCA.


Unique One Kilowatt Transmitter

November 1933

AIR-COOLING, all-A.C. operation, and modern styling were incorporated in a broadcast transmitter for the first time in the RCA Type 1-D Transmitter described in this article. Previously all broadcast transmitters employed motor generators to furnish d.c. for tube filaments. And all 1000-watt transmitters used water-cooled tubes in the output stage. The 1-D, first transmitter built in RCA's Camden plant, revolutionized the styling as well as the design of broadcast transmitters.


Program Amplifier – 1934 Design

February 1934

ALL-A.C. OPERATED studio equipment became practical in 1934 when RCA introduced the first A.C.-operated "studio" amplifier — the famous RCA Type 40-C. All previous equipment of this type had operated either from batteries or from an oversize plate rectifier. The 40-C was provided with a built-in power supply which also provided plate voltage for Type 41-B Preamplifiers. Used with a 94-B Monitoring Amplifier, it formed the first "all-A.C." audio channel.


Five Hundred Kilowatts

By LOREN F. JONES, in charge of Broadcast Transmitter Engineering, RCA Victor Company

May 1934

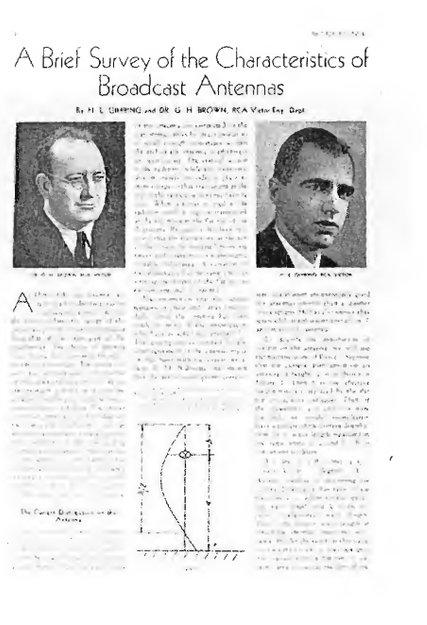
500 KW TRANSMITTER, designed by RCA engineers and installed at WLW, Cincinnati, in 1934, is described in this article by Loren F. Jones, then manager of RCA Broadcast Transmitter Engineering. This mammoth "super-power" transmitter was operated (under experimental license) by WLW for several years. It successfully proved the possibilities of super-power AM broadcasting by bringing radio programs to thousands of rural homes which were without primary service.


Tube Consideration in Class B Amplification

By LOY E. BARTON, Transmitter Engineer, RCA Victor

August 1934

CLASS B AMPLIFICATION considerations were discussed in this article by Loy Barton who developed the "Class B" modulation system while at the University of Arkansas. Soon after he joined RCA and helped RCA engineers design the first broadcast transmitters using Class B modulation. This is one of several articles on Class B modulation which Mr. Barton wrote especially for BROADCAST NEWS—typical of many advanced engineering stories in BROADCAST NEWS.


A Brief Survey of the Characteristics of Broadcast Antennas

By H. E. GIHRING and DR. G. H. BROWN, RCA Victor Eng. Dept.

December 1934

ANTENNA CHARACTERISTICS were discussed in this first of numerous articles written for BROADCAST NEWS by Dr. G. H. Brown and H. E. Gihring. Dr. Brown's studies of current distribution on various types of towers, and the relation of current distribution to radiation pattern, established the basis on which the design of directive antenna systems rests. Many of his articles were published in BROADCAST NEWS along with descriptions of station antenna installations.


The Specific Transmitter Performance Required for High Fidelity

By LOREN F. JONES, Transmitter Engineer, RCA Manufacturing Company

February 1935

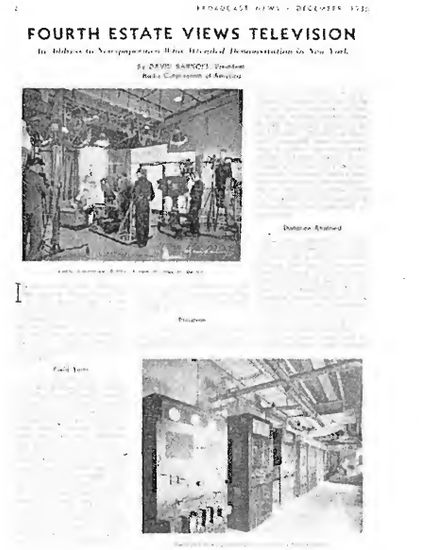
HIGH FIDELITY standards for transmitters were discussed for the first time in this article. The term "high fidelity" was first used to denote high-quality audio reproduction by Dr. Irving Wolfe of RCA Laboratories in 1931 and it had been the subject of considerable attention in BROADCAST NEWS and elsewhere. However, this article stated, for the first time, the specific transmitter performance required for high fidelity broadcast transmission of the full audio range.


DeLuxe Transcription Turntable Equipment

Designed to Meet the High Standards of Reproduction Exhibited in Modern Broadcast Stations, And to Maintain The Standard Union Contract Hard Vic

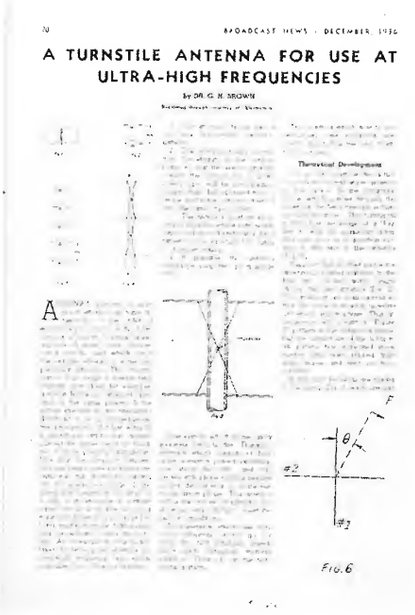
June 1935

TRANSCRIPTION TURNTABLES came of age with the RCA 70-A introduced in this BROADCAST NEWS article. The 70-A was the first practical high-quality turntable designed specifically for broadcast station use. In a very short time after this article appeared the 70-A became the almost unanimous choice of stations large and small. During the two decades since then thousands of 70-A's, 70-B's, 70-C's and 70-D's have been manufactured and a large number are still in use.


FOURTH ESTATE VIEWS TELEVISION

December 1936

TELEVISION PROGRESS REPORTS began in the fall of 1936, when RCA showed its first full-scale installation to newsmen, broadcasters and the industry. In the address printed in this issue General David Sarnoff, speaking to the assembled newsmen, said "we have invited you here to witness an experimental television test so that progress in this new and promising art may be reflected to the public factually rather than through the haze of conjecture or speculation".



A TURNSTILE ANTENNA FOR USE AT ULTRA-HIGH FREQUENCIES

by DR. G. H. BROWN

December 1936

TURNSTILE ANTENNA was described for the first time in this article by Dr. G. H. Brown of RCA Laboratories (reprinted by permission from ELECTRONICS). This first of many turnstile antennas developed by Dr. Brown and other RCA engineers was intended for VHF AM broadcasting (Apex), which at the time was enjoying some attention. Later it was adapted for FM, and—as the superturnstile—for VHF television where it is almost universally used in present-day stations.

SPACE BECOMES A FACTOR

New Consolette Features Compact Design

By C. M. LEWIS

November 1937

STUDIO CONSOLETTE embodying an entirely new concept was described in this article by C. M. Lewis (now Manager, Communications Products Department of RCA). Earlier studio control consoles incorporated controls only—amplifiers and power supplies were mounted on nearby racks. The RCA 76-A Consolette, described in this article was completely self-contained. It eliminated racks from the studio control booth and established a design pattern followed ever since.

TELEVISION IS HERE

July 1939

TELEVISION IS HERE, said the signs and the newspapers. And it was, if only for a short time. Simultaneously with the opening of the New York World's Fair in 1939 RCA began commercial telecasting. The July 1939 issue of BROADCAST NEWS for the first time offered commercial television equipment for sale. Included were the TT-1A Transmitter—first of an illustrious line—a field-type camera chain using an iconoscope as the pickup tube and accessory equipment.

RCA TELEVISION FIELD PICKUP EQUIPMENT

Description Of Units Designed For Remote Pickups

By THOMAS E. SHEA

SINGLE CAMERA SYSTEM

THREE CAMERA SYSTEM

July 1940

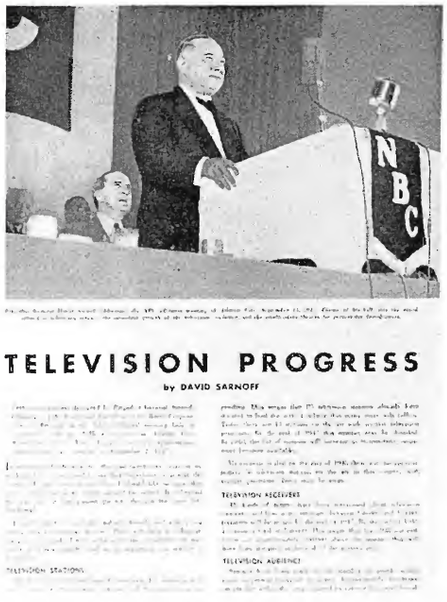
TV CAMERA CHAIN described in this article was the first television camera equipment to be produced commercially. It employed an iconoscope tube in the camera but was otherwise very similar in arrangement and appearance to field-type equipment in use today. Equipments of this type were used by NBC for television development work during the war. At war's end they became the pattern for RCA post-war equipment and the same arrangement of units is still used.

PERFORMANCE OF BROADCAST STUDIOS DESIGNED WITH CONVEX SURFACES OF PLYWOOD

by C. P. BONER

January 1945

POLYCYLINDRICAL DIFFUSERS for control of sound were first used on a large scale in the WFAA (Dallas) Studios constructed just before the war. These studios were designed by Dr. C. P. Boner of the University of Texas using information supplied by RCA engineers who had used this treatment in several RCA Recording Studios. Dr. Boner's work, reported in this BROADCAST NEWS article, led to widespread use of polycylindrical diffusers in radio broadcast studios.



TELEVISION PROGRESS

by DAVID SARNOFF

December 1947

GENERAL SARNOFF'S "ATLANTIC CITY SPEECH", as it is now referred to, appeared in the December 1947 issue. This is the speech, made to the NBC Affiliates Meeting in Atlantic City in September 1947, in which he strongly advised the NBC affiliates, and indirectly all stations, to get into television. Those who took his advice found themselves on the high road. It was an historic address — and BROADCAST NEWS broke its "no speeches" rule to print it.

August 1948

CONVENTION TELEVISION came into prominence at the National Republican and Democratic Conventions in Philadelphia in 1948. In a 20-page picture-article entitled "Philadelphia Story—How TV Stole the Show" the editors of BROADCAST NEWS described in detail the equipment setups of the "pool" and of each of the networks, together with a summary of how they operated during the convention. Probably no setup has ever been more thoroughly covered.

PRACTICAL EQUIPMENT LAYOUTS FOR TELEVISION STATIONS

December 1948

TELEVISION EQUIPMENT PLANNING has been discussed in many BROADCAST NEWS articles. One of the first and probably the most comprehensive was this 28-page article which appeared in the December 1948 issue. It included block diagrams, floor layouts, and photographs of six basic equipment setups. Because of its completeness it became the station engineers' chief planning reference. The basic equipment arrangments portrayed in it are as good today as in 1948.

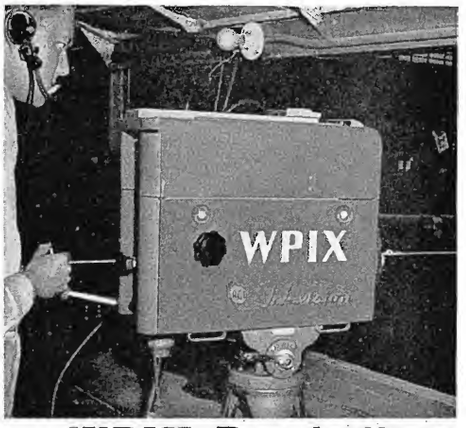
BASEBALL TELEVISION : 1949

AN UP-TO-DATE SURVEY OF EQUIPMENT SETUPS, OPERATING TECHNIQUES, CAMERA SWITCHING, MONITORING, ANNOUNCING AND PRODUCTION OF COMMERCIALS IN 31 STATIONS TELECASTING BASEBALL SCHEDULES IN 1949

by JOHN P. TAYLOR

September 1949

BASEBALL TELEVISION was a mainstay of the programs of many of the first television stations on the air—and it was one of the things that helped to publicize the new medium of entertainment. Methods of camera placement and switching were of great interest to station engineers. BROADCAST NEWS did a lengthy story on "Baseball Pickup" in the September 1947 issue—followed it with this very comprehensive "round-up" story in the September 1949 issue.

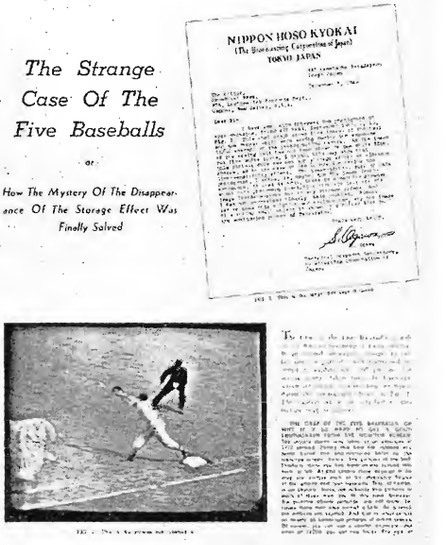


WPIX Baseball

HOW NEW YORK'S NO. 1 SPORTS STATION SETS UP ITS EQUIPMENT AND CONDUCTS OPERATIONS AT THE POLO GROUNDS – WITH PHOTOS FROM THE MONITOR SCREEN SHOWING FIELD OF VIEW WITH VARIOUS CAMERAS, EFFECT OF ZOOMAR LENS, AND TYPICAL CAMERA SWITCHING SEQUENCES

September 1949

WPIX BASEBALL was covered in a second article in the September 1949 issue. Purpose was to show, in detail, how one station did baseball pickups. Article included eight pages of "pictures from the monitor" showing typical scene sequences for various plays. Information for story was furnished by Tow Howard (then WPIX Chief Engineer, now Vice-President and Technical Director, WBTV, Charlotte) and Otis Freeman (then assistant engineer, now Chief Engineer, WPIX).



The Strange Case Of The Five Baseballs

or

How The Mystery Of The Disappearance Of The Storage Effect Was Finally Solved

NIPPON HOSO KYOKAI
(The Broadcasting Corporation of Japan)
TOKYO, JAPAN

February 1950

ENGINEERING DISCUSSION has often been prompted by articles appearing in BROADCAST NEWS, and this exchange of engineering opinion is, of course, one of the "services to the industry" in which BROADCAST NEWS takes great pride. The discussion note reproduced here resulted from a letter written to BROADCAST NEWS by an engineer of the Japanese Broadcasting Corporation about the baseball article which appeared in the September 1949 issue (see left).

HIGH GAIN AND DIRECTIONAL ANTENNAS FOR TELEVISION BROADCASTING

by LESTER J. WOLF

April 1950

HIGH-GAIN TV ANTENNAS became of great importance when the "defreeze" set new higher maximum powers for all TV stations. RCA engineers, anticipating the eventuality of this action, had been working on the development of such antennas for several years. Although directional TV antennas have, so far, been used only in a few instances, RCA engineers have also been working on these. This article is one of many on this subject printed in BROADCAST NEWS.

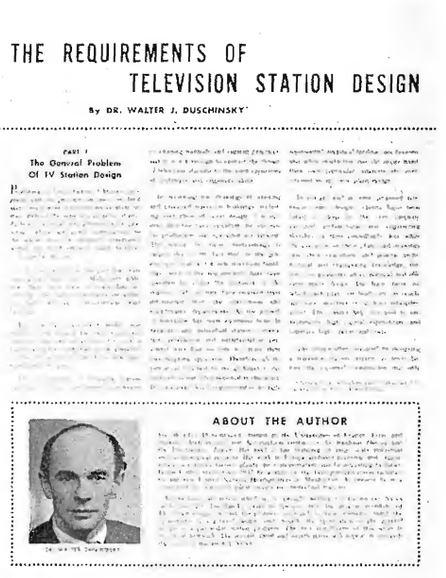

NEW "Unobtrusive" RIBBON-PRESSURE MICROPHONE

by
HARRY F. OLSON and
JOHN PRESTON
RCA Laboratories
Princeton, New Jersey

Ideal For TV and Broadcast Station Uses

May 1950

"UNOBTRUSIVE" MICROPHONES, of which there are now a number of types, were introduced for the first time in this article by Dr. Olson and John Preston of RCA Laboratories. The microphone described in this article was a laboratory model of a small-sized pressure-operated ribbon microphone. This is the microphone which in production became the famed "Starmaker". It led to a whole new technique in TV sound pickup, and to the development of a family of microphones.


THE REQUIREMENTS OF TELEVISION STATION DESIGN

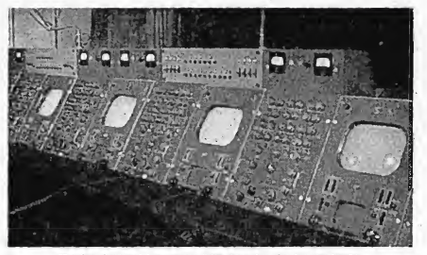
By DR. WALTER J. DUSCHINSKY

PART I
The General Problem Of TV Station Design

ABOUT THE AUTHOR

October 1950

TELEVISION STATION DESIGN has been discussed in many BROADCAST NEWS articles, from many different viewpoints. One of the most comprehensive and interesting discussions—especially in its forward-looking view—was the four-part article written by Dr. Walter J. Duschinsky, of which the first appeared in the October 1950 issue. Important basic concepts, such as the overall approach to "traffic flow" were clearly enunciated for the first time in this series.


HOW TO PLAN FOR COLOR

By
L. E. ANDERSON

January 1954

COLOR TELEVISION was "covered" by BROADCAST NEWS for the first time in the January 1954 issue. It was not discussed previously because the standards were so controversial there was little a station engineer could do about color in a practical way. However, in December 1953 the FCC finally approved compatible color. BROADCAST NEWS was ready, and within weeks the January 1954 issue—devoted exclusively to color—was in the hands of station engineers.


3-VIDICON COLOR FILM CAMERA

By H. N. KOZANOWSKI

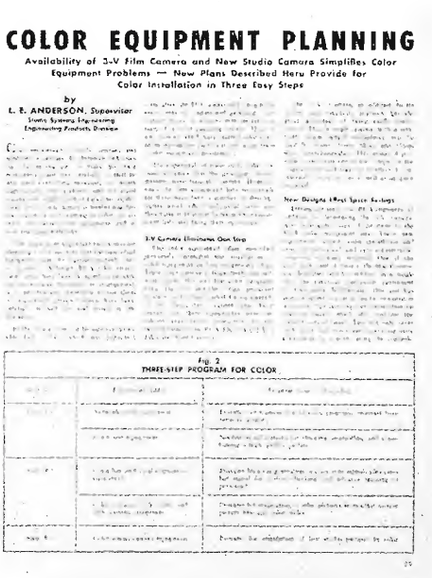
May 1954

3-V COLOR FILM CAMERA was described in detail, for the first time, in this article by Dr. H. N. Kozanowski, whose advanced development engineering group was responsible for the development of this truly revolutionary color film camera. Previously used film pickup equipments—using the fly spot technique—had required unwieldy special-type projectors. The 3-V Camera, because it could be used with standard TV film projectors, made color film transmissions practical.

WKY-TV's experience with live color

December 1954

COLOR STATION INSTALLATIONS stories began with exhaustive descriptions of color installation and operation at WKY-TV, Oklahoma City; WBAP-TV, Ft. Worth; and WTMJ-TV, Milwaukee. These were the first three non-network stations to start regular color programming. Because their experience with color was of great interest to all stations BROADCAST NEWS "wrote up" their color operations in detail, including not only technical operation, but also programming experience.


COLOR EQUIPMENT PLANNING

Availability of 3-V Film Camera and New Studio Camera Simplifies Color Equipment Problems — New Plans Described Here Provide for Color Installation in Three Easy Steps

by
L. E. ANDERSON, Supervisor
Station Systems Engineering
Engineering Products Division

Fig. 2
THREE-STEP PROGRAM FOR COLOR

February 1955

COLOR EQUIPMENT PLANNING was discussed at length in this 32-page article by L. E. Anderson, Supervisor of RCA's Studio Systems Engineering. Describing a "three-step" program for getting into color it showed by photos, block diagrams and rack layouts exactly how a station could progressively add equipment units to gradually step up its color facilities to "all-color" operation. A large number of stations are following this plan—it provides for expansion without obsolescence.

THE DEVELOPMENT OF THE COLOR MARKET

by THOMAS F. JOYCE
*President, Raymond Rosen & Co., Philadelphia**

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(Excerpts from talk before the NARDA** Institute, Washington, D.C., August 18, 1956)

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You have heard, or read, any number of prophecies on when color will arrive. Most of these predictions have been made by representatives of TV manufacturers who have consistently taken a negative approach to color TV. Many of these gloomy "Gusses" represent the same radio manufacturers, whose business is now predominantly TV, who took a decidedly negative approach to black-and-white TV before the war and for a number of years following the war. Therefore, when I make the statement to you that *color is really beginning to move* I know I must be prepared to back this statement with facts. I think I can do that.

At Raymond Rosen our color billings were $288,000 in July, will run about $190,000 in August, $400,000 for September. Within a year or so, color TV should represent a $25,000,000 annual business for our company alone—if we can get the delivery of the merchandise.

Translated into national business what does this mean? At the opening of the RCA Traveling Color Exposition at Gimbels in Philadelphia on October 15th, General Sarnoff said, "We expect to manufacture and sell 200,000 color television sets in 1956, as we originally estimated, and it is a conservative estimate that RCA alone will produce and sell 500,000 color television sets in 1957."

Thomas F. Joyce

Now you might well ask the question, "Who is smoking opium?" Well, let me tell you, it isn't RCA. General Sarnoff and Frank Folsom and their associates didn't build RCA into a company that last year did over a billion dollars worth of business by smoking opium. They built it into that kind of a business by having vision for the future and the guts to make investments ahead of the future to be prepared for the future when it arrived.

Let's take a look at the record. Back in 1943, talking before the Federal Communications Commission in an attempt to get the FCC to give the go-ahead for black-and-white television after the war, and although at that time there were only 5 thousand black-and-white television sets in use, RCA said, "Within 5 years after the war the industry will be selling 3½ million black-and-white television sets a year."

Now back in those days RCA wasn't just handing out a lot of propaganda. It was making plans for investments immediately after the war—in television research, plant and broadcast facilities to make what they said was going to happen come true. Again, the record.

Within five years after the war, the industry was selling black-and-white television sets—not at a rate of 3½ million a year—but at a rate of 5 million a year.

What are the keys to the mass color television market? There are five keys. First, people don't buy color television sets just to have an electronic gadget around the house. Second, the color television set priced for the mass market. Third, proper service to insure customer satisfaction. Fourth, credit facilities to enable people to buy it on a budget program. And fifth, the market.

Let's see what we've got. First, color television broadcasting facilities. You have to have broadcasting facilities first. When black-and-white television got going after the war, there were only five cities in the United States with black-and-white broadcasting facilities. It was a local service—it wasn't a national service.

It was five years after the war, 1950 to be exact, before there was coast-to-coast television broadcasting. What do we have today? We have 215 television stations equipped for color in 137 cities. American Telephone and Telegraph Company has converted 52,000 of its 75,000 miles of television interconnecting facilities for color. We have color broadcasting coast-to-coast and border-to-border. It is no longer a local service. We have two color television broadcasting networks: The National Broadcasting Company and the Columbia Broadcasting System.

What about color television programming? NBC, starting in September, a minimum of 80 hours a month, a minimum of 1 hour a night between 7:30 and 10:30 p.m., 7 days a week. Thirty-nine Spectaculars of 1½ hours, in addition to the above, between September 1 and June of next year. CBS—3½ times more color TV programming than they had a year ago.

Key No. 2 to the color television market is color television at budget prices—not next year, or 2 years from now, but right now with BIG COLOR Television at $495 by RCA.

Now, RCA not only has a color television set at $495, but more importantly, it has a complete line of color television sets, 10 models to be exact. RCA stylists have done a wonderful job on the cabinets

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* Raymond Rosen & Co. is the distributor for RCA Victor Television Receivers (as well as other RCA products) in eastern Pennsylvania and southern New Jersey. The market potential for the market they service is 3.6% of the national potential.

** National Appliance & Radio-TV Dealers Association.

Thomas F. Joyce

Merchant of Television

Article by Mr. Joyce in January 1944 issue of BROADCAST NEWS.

BROADCAST NEWS is celebrating its twenty-fifth anniversary this month (see Pg. 32). During all of this twenty-five-year period we have adhered closely to our original premise; namely, that we could best serve the industry by limiting ourselves to articles about equipment planning, equipment installation and equipment operation. However, there occasionally comes to our attention an article or paper which, while not dealing directly with broadcast equipment, is, nevertheless, so closely related to the interests of broadcasters, and so important to them, that we feel impelled to bring it to their attention. Tom Joyce's NARDA talk, which we are printing here, is just such an article. In it Mr. Joyce forthrightly presents his feelings about the prospects for color. Certainly this is a subject of great interest—and importance—to all television broadcasters.

To most of the industry Tom Joyce needs no introduction. A born merchandiser he has spent practically his whole business life in the marketing end of the radio and television industry. He started with what is now the RCA Tube Division at Harrison, N. J., in 1922, and rose through the ranks to positions as advertising manager of the Tube Division, advertising manager for all of RCA's manufacturing divisions, and, finally, manager of the Radio, Phonograph, and Television Department. At the time of the World's Fair in 1939 he played an important part in planning RCA's participation in the Fair, as well as the simultaneous announcement of the beginning of "commercial" television and of TV receiver sales to the public. In 1945, after 23 years of service, Mr. Joyce left RCA to become Vice President of Raymond Rosen and Company of Philadelphia. In 1952 he was named President.

Raymond Rosen and Company is the distributor for RCA Victor Television Receivers (as well as other RCA products) in eastern Pennsylvania and southern New Jersey. Under Mr. Joyce's direction the company has been one of the nation's outstanding distributors of black-and-white television receivers. When color receivers became available Raymond Rosen and Company immediately recognized the new opportunity and launched an intensive campaign designed to bring color to the public as fast as possible. As a result the company quickly became, and has remained, the nation's number one distributor of color receivers. It was because of this success, as well as because of his own personal enthusiasm for color, that Tom Joyce was invited to tell the NARDA Institute about the color market as he saw it.

This is not the first talk of Mr. Joyce's which we have published. The first appeared in BROADCAST NEWS, Vol. No. 38, January 1944. Entitled "The Development of the Television Market in the Postwar Period" it was delivered by Mr. Joyce, then manager of RCA's Radio, Phonograph and Television Department, before the American Television Society in November, 1943. In it Mr. Joyce plotted in detail the course which he believed the television receiver boom would follow.

Let's read what Mr. Joyce said in his 1943 address: "Ten per cent (of the homes in areas receiving TV signals) would represent 741,000 homes with television . . . in my opinion this could be attained in two to three years after the full commercialization of television."

According to RETMA records 975,000 television receivers were sold in 1948, the third year after "commercialization". Thus Mr. Joyce was almost exactly right in his prediction. Further on in his 1943 talk he said: "In approximately five years . . . receiver sales should be at the rate of approximately 2,500,000 units per year." Here again he was close—this rate actually being attained near the end of the fourth year. In similar fashion, and with almost as great accuracy, he predicted the growth of the TV networks and the increase in number of stations.

In 1943 Mr. Joyce was able to make these close estimates because he had made careful surveys in eleven cities across the country and had studied the whole situation in minute detail. Similarly, in 1956, he is not talking through his hat. His firm has conducted test selling campaigns in its own area, has its own color set sales figures to go on. In addition he has obtained, and carefully studied, the results of other surveys which have been made. There is probably no one in the industry who is better qualified than he to forecast the future of color set sales.

—each a beauty to behold. They are priced in logical step-ups of $50 from $495 up to $850. Here is a color TV line to suit every taste, purpose and purse.

Key No. 3 for the mass color television market is color television installation and service that guarantees customer satisfaction. When you sell a color television set you want to be able to know with complete confidence that the purchaser is going to be a happy customer.

In the market served by Raymond Rosen & Company alone, RCA Service Company maintains 11 branches, 210 trucks, 250 technicians and $75,000 worth of color test equipment. All for one reason, to make sure that these color sets are properly installed and to make certain that customers are satisfied.

Within the past few months RCA reduced the price of its Color Television

Service Contract, including installation and service for one year, from $139.50 to $99.50. Now, actually, a Color Television Service Contract costs less on a price-ratio basis than a black-and-white contract does. For example, the average retail price for a black-and-white television set is about $254. A one-year RCA Service Contract is $59.95; therefore, the cost-ratio is roughly 25%. RCA estimates the average color sale around $600 retail. With a one-year contract at $99.50 this is 16⅔%, about ⅓ lower to service a color set than a black-and-white set on a cost ratio basis. After all, if you buy a Cadillac you expect to pay more for service dollar-wise but not percentage-wise than when you buy a Chevrolet.

Key No. 4 to the mass color television market is credit. The great industries of America, consumer industries, have been built on credit—the auto, appliance, and the furniture industry. The big boom in home building since the war has been made possible by credit. A few months ago we got after the First Pennsylvalia Company, Philadelphia's largest bank, because they wanted 25% down with 18 months to pay on color as against 15% on black-and-white with 24 months to pay. We sold Mr. Kelly, the President, on the idea that a color television set actually was a better investment than a black-and-white set from the standpoint of the consumer and, therefore, represented better collateral to the bank. With the result that the bank reduced the down payment from 25% to 10% but kept the black-and-white at 15% with 24 months to pay. In other words, for a lower down payment they are willing to finance a color television set. When RCA's 1957 color TV line with substantially lower prices was announced, we asked for 36 months to pay on a color television. In June the Executive Committee of the First Pennsylvania Company of Philadelphia approved 30 months to pay on color as against 24 on black-and-white with the inducation that at a later date the bank might go to 36 months on color.

Now, what is the significance of this action by the First Pennsylvania Company? The significance is this: last year there were about 2 million television consoles sold in the United States for more than $300 retail. We did a tremendous job in our territory and RCA did a tremendous job nationally on a console which sold for $329.95. Now, using the same down payment across the board with 24 months to pay on a black-and-white set and 30 months to pay on color, the monthly payment charge is $14.62 on a black-and-white set and $16.15 on a color set—making the differential $1.53 a month. I was taught in school that there were 30 days in a month. If you divide that into $1.53, it gets down to the fact that for only 5¢ a day more your customer can have a color television set. Now, in talking to a customer a dealer can say, "Look—wouldn't you spend a nickel to get color, a nickel a day more to get a color set—the set of the future—today?"

The Commercial Credit Corporation of Baltimore, Maryland, has gone even further than the First Pennsylvania Company. It has approved 36 months to pay on color. So have other banks in our area.

Now, why are cold-blooded bankers willing to give 30 months and now 36 months to pay on color television, but only 24 months on black-and-white? Believe me, it's not out of the kindness of their hearts. It's because a color television set is a better investment from their standpoint than a black-and-white.

If you were operating an airline and you went in to see one of the big bankers in the United States—and said, "Look, I want a loan of 30 million dollars in order to buy 15 propeller-driven passenger aircraft," the loan officer of that bank would think you were crazy. Even though all of the passenger craft that are flying in the United States are propeller-driven. And why? Because he knows that jet planes are on the way; that a jet plane will carry more passengers faster and at a lower cost than a propeller-driven plane. You wouldn't be able to liquidate your investment before the new propeller-driven planes would be obsolete. The same thing goes for color. It's tomorrow's TV set available today.

Now the 5th thing we need is a market. The estimate is that within the next 12 months, 7 million television sets will be sold. So, we already have a market. We have a market that has been conditioned to buy something that is unnatural; namely, a picture of something that is the way it isn't—in black-and-white. Everything we see in life is in color—the clothes we wear, the food we eat, all the things we see outdoors and in our homes are in color. Now, through the miracle of electronics, it becomes possible for the first time on a mass basis, at an *economical cost,* to deliver color pictures to the people at a price they can afford to pay.

Recently, Daniel Starch was making a survey of consumer buying intentions of major appliances, automobiles, etc. In answer to the question, "if you are planning to buy a television set now, what will it be, black-and-white or color?" 53% said color.

In May we conducted a test campaign in Wilmington. We said to our dealers, "Look—we want to put on a concentrated selling effort on color. We want to work with the RCA Service Company. The RCA Service Company has in its Wilmington shop 15 outside servicemen. They make hundreds of calls a week. What better time to talk about a color television set than when you're in fixing up a broken down black-and-white set? Let's make these people color conscious."

So, we gave the servicemen some sales training. We equipped them with line folders on color television sets. We put them in a position to say that if the customer would like to have a free home demonstration without obligation, it would be arranged. With what results? With the result that in the last 2 weeks in May, when we got this program going, we made more home demonstrations of color television receivers than in the previous 4½ months in Wilmington.

The second thing we accomplished was to sell more color television sets to the public in a two-week period than we had sold in the previous 4½ months. Third, we had more solid sales prospects unearthed for the future, color television salesmen reported, than for the previous 4½ months.

Sixteen per cent of all the homes visited in connection with these regular service calls said that they wanted a color demonstration now. People don't ask for a home demonstration unless they are interested in buying because they know there is an obligation implied that goes with a free home demonstration. Sixteen per cent of them secured home demonstrations during that period; 35% additional said that they would be interested in a home demonstration of color television some time this fall. If you add 16 and 35 together, you get 51. Remember that Starch figure of 53?

To sum it up: we have color broadcasting facilities, we have color programs, we have the under $500 big-screen color TV set, we have service facilities, we have long-term credit, and we have a demonstrated market. All the five keys to the mass color market. That's why, with these factors, plus our demonstrated sales experience, that I make the predictions I do concerning the buildup in our color TV sales rate. We are sold on color TV—and we find that being sold on color TV makes it easier for us to sell our dealer organization—and through these dealers, the public.

A. R. HOPKINS NAMED MANAGER OF NEW RCA COMMERCIAL ELECTRONIC MARKETING DEPARTMENT

Appointment of A. R. Hopkins to the newly created post of Manager, Commercial Electronic Marketing Department, Radio Corporation of America, has been announced by Arthur L. Malcarney, Vice-President and General Manager, RCA Commercial Electronic Products.

Formerly the Manager of the Broadcast and Television Equipment Department, Mr. Hopkins now assumes broad administrative and functional responsibilities for the marketing of all RCA commercial electronic products.

The new marketing department will have functional responsibility for all marketing activities within the Commercial Electronic Products organization, and also will administer new product, advertising, sales promotion, contract, and market research.

The RCA Commercial Electronic Products organization comprises four major product departments—Broadcast and TV Equipment, Communications Products, Theatre and Sound Products (which also embraces RCA industrial and scientific equipment) and Bizmac Marketing.

The new Marketing Department has been established to provide improved customer service for all RCA commercial electronic products. The Department will centralize the planning, direction, and action essential to meet customer needs promptly and efficiently.

Mr. Hopkins has been associated with RCA sales, merchandising and engineering activities for more than 27 years. He joined RCA as an engineer in 1929. In 1935, he transferred to RCA broadcast sales activities and shortly was advanced to Manager, Broadcast Audio Sales. In 1937, he was assigned to the company's Chicago office where for nine years he was Broadcast District Manager, then Regional Manager for the former RCA Engineering Products Department.

In 1946, Mr. Hopkins was advanced to Sales Manager, Broadcast and Industrial Department, with headquarters in Camden,

N. J. Subsequently, he was advanced to General Sales Manager, Engineering Products Department; Manager, Broadcast Marketing Department; and Manager, Broadcast and TV Equipment Department.

EDWIN C. TRACY APPOINTED MANAGER, RCA BROADCAST AND TV DEPARTMENT

Appointment of Edwin C. Tracy as Manager, Broadcast and Television Equipment Department, Radio Corporation of America, was recently announced by Arthur L. Malcarney, Vice-President and General Manager, RCA Commercial Electronic Products.

Formerly Sales Manager of the department, Mr. Tracy succeeds A. R. Hopkins, who recently was advanced to the newly created post of Manager, RCA Commercial Electronic Marketing Department.

As Department Manager, Mr. Tracy assumes responsibility for all activities relating to the development, engineering, marketing, and sales of RCA transmitting and studio equipment for radio broadcast stations, color and black-and white TV stations, and closed-circuit TV applications.

Mr. Tracy has been associated with RCA engineering and sales activities for more than 17 years. He joined the RCA Service Company in 1939 as a television engineer and shortly thereafter was assigned to RCA's television operations staff at the New York World's Fair.

During World War II, from 1941 to 1945, he was assigned to numerous field projects, in this country and abroad, involving the testing, installation, and maintenance of RCA electronic equipment developed for the U. S. military forces.

He was honored, in 1942, with a Presidential Citation, presented by President Franklin D. Roosevelt, for the development of portable test equipment for aircraft altimeters which made possible important time reductions in test procedures.

In 1945, Mr. Tracy transferred to the RCA broadcast equipment activity as a field sales engineer, assigned to the Chicago regional office. In 1950, he was advanced to Field Sales Manager, Broadcast Equipment Sales, with headquarters in Camden, N. J. Three years later, he was named Sales Manager for broadcast equipment.

by J. W. WENTWORTH and R. T. ROSS

TV Terminal Equipment Engineering

1500 MILLIAMPERE POWER SUPPLY FOR BROADCAST TV USE

New High Performance Regulated Power Supply Offers Up to 70 Per Cent Reduction in Rack Space and Low Cost Per Milliampere

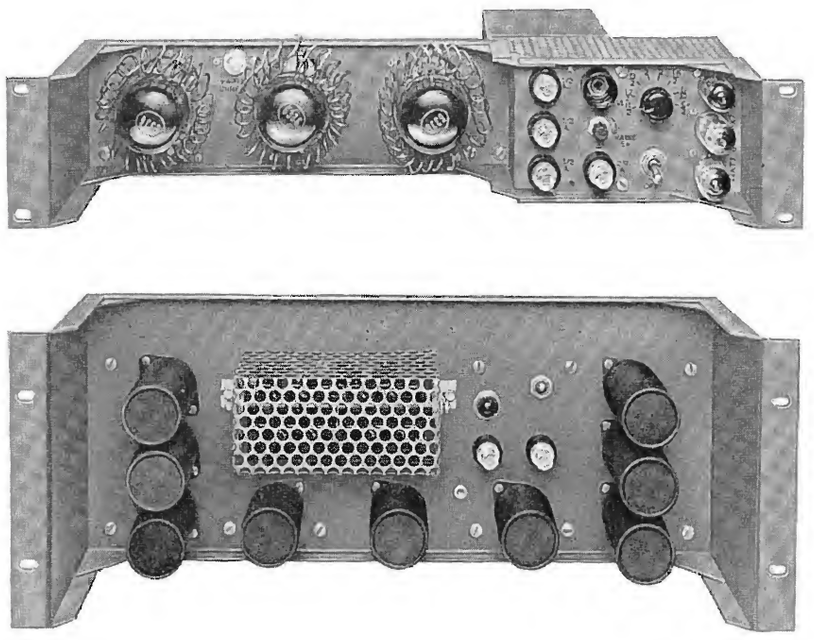


FIG. 1. New regulated power supply has two-chassis construction. The regulator (top) chassis contains only 6 tubes—rectifier chassis contains all the rectifier and filter elements.

Considerable interest has been aroused by RCA's new WP-15 Regulated Power Supply, which was demonstrated at the 1956 NARTB Convention, and announced in the June, 1956 issue of BROADCAST NEWS. This article is intended to provide additional information on this significant new piece of equipment—to explain *why* certain features were included in the design, and to show *how* some of the high performance specifications have been achieved.

Objectives of the WP-15 Design Program

As a first step in the development of a new power supply to supplement or replace the "old reliable work-horses" in the RCA line (the WP-33B and the 580-D, supplying 600 and 400 milliamperes, respectively), a study was undertaken to yield an up-to-date view of the technical and economic significance of power supplies in typical broadcast stations. This study indicated that the power supply characteristics of greatest importance are the following:

(a) *Basic performance*—The main objective of a regulated power supply in a broadcast station is to provide highly stabilized +B power to the station's operating equipment. A good degree of regulation under varying conditions of load, line voltage, and temperature is vital to the proper operation of the entire plant.

(b) *Initial cost.*—Power supplies are relatively simple electronic devices, and hence are relatively inexpensive. The fact that a rather large number of supplies is required for a typical broadcast plant means, however, that the fraction of the total capital investment required for power supplies is large enough to justify considerable emphasis on initial cost.

(c) *Direct operating cost.*—The direct operating cost for the tubes and other limited-life components in power supplies is also quite significant because of the relatively large number of supplies required for a broadcast plant.

(d) *Reliability.*—As in the case of most broadcast equipment, the reliability of a power supply is probably even more important than its cost, because a sudden failure can result in a substantial loss of revenue. It is therefore important that broadcast power supplies be designed for high reliability, and that adequate fuses and other safety devices be used to minimize possible damage and to permit rapid restoration of service in the event of trouble.

(e) *Efficiency.*—The efficiency of a power supply affects the indirect operating cost in two ways—high efficiency helps to reduce the total power bill for the station and minimizes the air conditioning requirement for the equipment racks.

(f) *Space requirements.*—It is desirable to minimize the space required for power supplies for two reasons: (1) space costs money in either new or old buildings, and (2) a reduction in the space required for power supplies can make possible room for expansion in existing installations when rack space is at a premium.

(g) *Personnel safety.*—A basic requirement for any equipment is that it be safe to operate and to service. This is particularly important in the case of power supplies providing high voltage at low source impedance.

(h) *Flexibility.*—To minimize the number of equipment types used in a broadcast plant, it is desirable that a power supply be adaptable to a wide range of applications. This implies, among other things, suitability for mounting in a variety of locations.

The general characteristics of the WP-15 Regulated Power Supply were established by giving appropriate weight to each of the significant characteristics listed above. It emerged from the design program as a supply of 1500 milliampere capacity built in two sections—a rectifier unit requiring 7 rack inches, and a regulator unit requiring 3½ rack inches. Modern components and design techniques have been used throughout. In particular, the transformers and filter choke use modern high-temperature insulation, the rectifier is a high-efficiency germanium diode stack and the regulator tubes are double triodes.

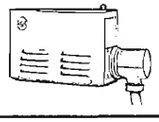
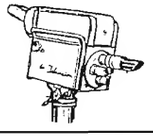
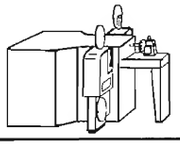
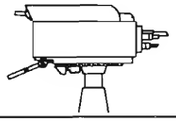
Why 1500 Milliamperes?

A maximum capacity of 1500 milliamperes was decided upon as optimum for the WP-15 after a careful consideration of the factors of cost, space and systems requirements. In general, the cost per milliampere for a power supply is reduced as its maximum capacity is increased. The reason for this is that the number of components required for a power supply does not increase in proportion to its capacity. Certain functions, such as the d-c amplifier, have much the same requirements for a supply of any size, while other major components like transformers and chokes are increased in size but not in number. It normally costs less to build one large transformer or similar component than to build several smaller ones with the same total rating. A larger supply also results in a saving in space relative to a group of smaller supplies.

The practical upper limit on power supply size is determined primarily by systems requirements, particularly with respect to reliability and flexibility for expansion. If a power supply is large enough to supply an appreciable fraction of the total power requirements for a broadcast plant, it is usually necessary to provide emergency spare facilities with fairly elaborate switching means (preferably automatic) to achieve the necessary reliability. An overly large power supply also makes it difficult to provide for future expansion without economic waste.

The RCA study of power supply requirements led to the conclusion that 1500 milliamperes was the optimum size for a modern power supply, because a supply of this capacity can power a wide variety of equipment groups, each of which comprises a functional unit. A few of the many possible equipment groups are shown in Table I. The 1500 milliampere size makes possible significant cost savings relative to older, smaller capacity designs, but retains much of the reliability and flexibility inherent in the use of separate power supplies for each significant equipment unit or group.

TABLE I — Equipment Groups and Power Supply Requirements

EQUIPMENT USED	PREVIOUS POWER SUPPLY AND SPACE NEEDED	POWER SUPPLY AND SPACE NOW NEEDED	WP-15 SAVING
 TK-21 Black and White Film Camera	2 WP-33B's 28″	1 WP-15 10½″	17½″
 TK 11/31 Black and White Live Camera	2 WP-33B's 1 580D 38½″	1 WP-15 10½″	28″
 TK-26 Color Film Camera	2 WP-33B's 3 580D's 59½″	2 WP-15's 21″	38½″
 TK-41 Color Live Camera	3 WP-33B's 2 580D's 63″	2 WP-15's 21″	42″

NOTE: Comparisons are based on the number of WP-33B and 580D power supplies necessary to provide 1500 ma.

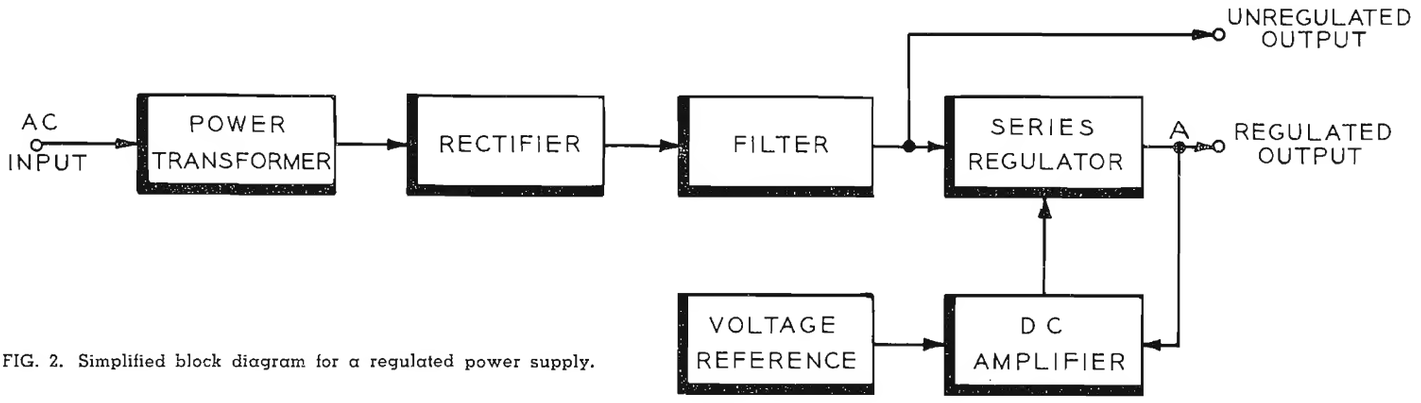


FIG. 2. Simplified block diagram for a regulated power supply.

Performance Stability

The basic circuit configuration for regulated power supplies, shown in block diagram form in Fig. 2, has remained essentially unchanged for a great many years. Power supplies of various types differ substantially from each other in terms of performance, however, because of differences in the amount of attention given to the many small design details that spell the difference between a run-of-the-mill design and a truly outstanding one. The WP-15 is able to provide voltage stability within 0.2 volt (out of 280 volts) with a ripple voltage of less than 0.002 volt peak-to-peak because each circuit and component has been carefully engineered for optimum performance. Some of the electrical design highlights are described below.

The series amplifier and d-c amplifier in a regulated power supply comprises a feedback loop, which gives the power supply its inherent stability. It is a basic principle in the design of feedback circuits that the overall performance is best when the feedback loop is called upon to do the least work. In other words, it is good practice to make a design as good as possible without feedback, and then add feedback to get a substantial bonus in performance.

As applied to power supplies, this means that it is desirable to design the power supply with the best possible regulation even in those circuits which precede the series regulator. In the WP-15, such good performance has been achieved by proper design of the power transformer, by the use of a high-efficiency germanium rectifier, and by the use of a choke-input filter (in preference to the cheaper but less effective capacitor-input filter used in many power supplies).

The stability of a regulated power supply can never be any better than that of the voltage reference against which the output voltage is compared in the d-c amplifier. In the WP-15, the voltage reference is provided by a Type 5651 voltage reference tube, which is the most accurate and stable gaseous-discharge tube commercially available.

Even the mechanical design of a regulated power supply can have a surprising effect on its stability. The major features of the WP-15 mechanical design will be reviewed later in this article, but it should be observed here that particular care has been taken to locate the voltage reference tube and the d-c amplifier well away from all sources of heat so that they can operate under stable temperature conditions.

Excellent Regulation

A *plus* feature in the WP-15 that makes possible excellent regulation even in cases where the load is supplied over a long length of cable is an optional provision for sampling the output voltage at the load, rather than at the supply itself. To accomplish this, the connection to the d-c amplifier shown at point A in Fig. 2 is transferred to the load by means of an additional lead in the power supply cable. The resistance of the wire carrying current to the load is thus included in the feedback loop, and is properly compensated for. The resistance of the return lead conveying the sampled voltage for the d-c amplifier is not significant, because this lead carries only about one milliampere.

Another significant characteristic of the WP-15 electrical design is the absence of a low-frequency resonance problem. In many power supplies, the filter which precedes the regulator has a natural resonant frequency at about four or five cycles per second. A relatively high impedance at this frequency can cause a supply to "bounce", particularly when it is used with an intermittent load. This bounce problem has been eliminated in the WP-15 by designing the filter with sufficient capacitance to make the natural resonant frequency so low that its effect is negligible.

Mechanical Design Features

The most striking feature of the WP-15's mechanical design is its two-package construction; the transformer, rectifier, and filter are mounted on a chassis which can be separated from a second chassis which contains the regulator tubes, the d-c amplifier, and the voltage reference tube. The total rack space required for both units is only 10½ inches, the same space required for the older 580-D supply which delivers only 400 milliamperes!

The use of separate chassis provides considerable flexibility in systems arrangement, and adds to reliability by greatly increasing the number of applications where trouble-free convection cooling can be used instead of forced-air ventilation. Since the regulator tubes are the greatest source of heat in a power supply (especially where highly efficient germanium diodes are used as rectifiers), it is a definite advantage to be able to mount all the regulators in a given installation near the tops of their respective racks, and to mount the rectifier units near the floor level where the air is coolest.

It is also desirable in many cases to be able to locate all the rectifiers for a given plant in a centralized location, but to locate the regulator units near the equipment to be powered for greatest operational convenience. Such equipment arrangements are easily achieved with the WP-15 supply.

To reduce both size and weight, the transformer and filter chokes for the rectifier unit are of open-core construction. They are mounted on the back of the rectifier chassis so as not to interfere with the ventilation of the germanium stack, the electrolytic capacitors, or other equipment units mounted above or below the supply. For personnel safety, the entire back of the rectifier chassis is fitted with a perforated metal cover, which is readily removable for servicing. As an additional safety feature, indicator lamps are used on the front and back of both chassis to indicate the presence of high voltage.

A unique feature of the regulator chassis is its "split level" construction, which serves to elevate the fuse holders, meter jack, and controls so that they can be

reached without risk of touching the hot regulator tubes. This same construction also provides a relatively cool location for the voltage reference tube and the d-c amplifier.

The 6336 regulator tubes are equipped with simple but effective heat radiators which help to minimize the air requirements for cooling. No forced ventilation is required for up to three regulators mounted immediately adjacent to each other, or for up to five regulators if a single-space blank panel (1¾ rack inches) is mounted between each chassis. Larger numbers of regulators may be mounted in a single rack if adequate forced-air ventilation is provided to keep the tube bulb temperatures within normal ratings.

Installation and Operational Advantages

Like all RCA broadcast equipment, the WP-15 is designed to serve as a "building block" in a variety of operational systems. ranging from very simple broadcast plants to highly complex installations. The basic mechanical design is compatible with other equipment designs in the RCA line, so a systems planner has maximum freedom in determining where to locate the power supplies. This is particularly advantageous when planning expansions for existing systems; in such cases, rack space is often at a premium, and is seldom arranged for maximum convenience in installing new equipment. The WP-15 also has a number of electrical design features which make it easy to install and convenient to use.

One particularly convenient design feature is the provision for interlocking the control of the regulator and rectifier chassis, or for interlocking two or more supplies to each other. Figure 3 shows how the a-c input wiring to the two chassis is interconnected such that OFF-ON control is possible from either unit. The use of a relay, as indicated, permits the desired dual control without the necessity of handling the major current load through the cable which interconnects the two chassis.

Figure 4 illustrates one possible method of interlocking two WP-15 power supplies in such a way that one of them can be operated independently, while the other can be used only in combination with the first. A practical example of a situation where this type of interlocked connection is desirable is provided by the TK-41 Color Camera Chain. As indicated in Table I, the +B requirements of the complete color camera chain can be supplied by two WP-15's. These would normally be connected in such a way that the camera proper is powered from one supply, while the processing amplifier, colorplexer, and master monitor are supplied by the other.

Since the processing amplifier provides drive pulses to the deflection circuits in the camera, it is necessary that the amplifier be "ON" whenever the camera is operated in order to prevent damage to the deflection output tubes. On the other hand, it is sometimes desirable to operate the processing amplifier, colorplexer, or master monitor without actually having the camera in service. This type of operation is readily obtained by the interlocked connection shown in Fig. 4 if the camera proper is connected to Power Supply No. 1 and the auxiliary equipment is connected to Power Supply No. 2. In other applications, it is possible, of course, to cross-connect the supplies in such a way that neither can be operated independently of the other.

For additional operating convenience, the fuse-holders used on the WP-15 are all of an indicating type; a neon lamp in the cap of each fuse-holder glows when the fuse blows out, making it easy to locate troubles rapidly. The 6336 regulator tubes are all fused separately, so that failure of one tube will not automatically overload the remaining tubes and cause them to fail also. Preventive maintenance to guard against sudden tube failures is facilitated by provisions for metering the current drawn by each triode section in the regulator, using the RCA MI-21200-C1 plug-in meter.

The RCA WP-15 Regulated Power Supply thus represents a high current capacity supply with up to 70 per cent reduction in rack space priced at only 45 cents per milliampere. This well-regulated source of d-c voltage is excellent for television broadcasting; also for closed circuit, communications and laboratory applications.

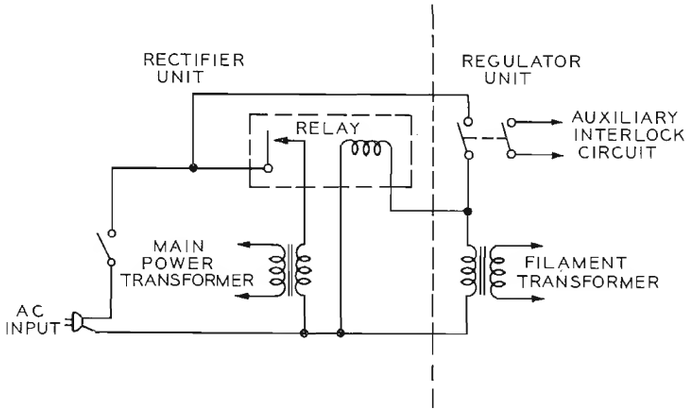


FIG. 3. Schematic diagram in simplified form showing the a-c wiring for the WP-15 power supply and interlock connections between the rectifier and regulator units.

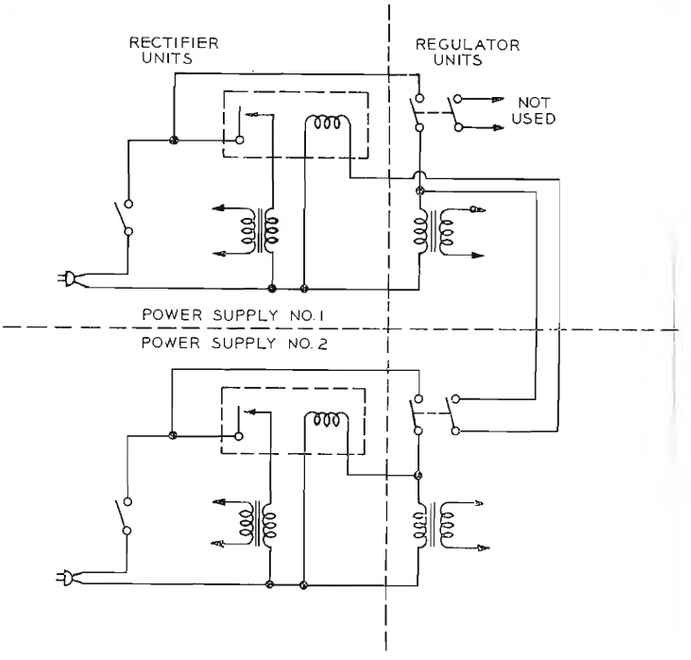


FIG. 4. Diagram showing the a-c wiring for two WP-15 power supplies in an interlocked connection. In this connection, supply No. 2 can be used alone, but supply No. 1 is operative only when supply No. 2 is also "On".

LATEST DEVELOPMENTS IN VHF TELEVISION TRANSMITTERS

Unconventional Design Affords Savings in Space, New Convenience of Operation and Utmost Ease for Expansion

by F. E. TALMAGE,
Broadcast Transmitter Engineering

A new series of low-band RCA VHF Transmitters is now available with power outputs ranging from 2 to 25 kw. After considerable study three power levels (2, 6 and 25 kw) were chosen as most nearly meeting the requirements of Broadcasters. The 2 kw rating has been found to be about the lowest practical power rating for a VHF station eliminating, of course, satellites, boosters, and proposed drop-ins. A power rating of 25 kw has been found to be the most popular rating for obtaining maximum erp on the low band when used in conjunction with practical antenna gains. An intermediate power rating of 6 kw was chosen because it is the most economical driver unit for our 25 kw amplifiers.

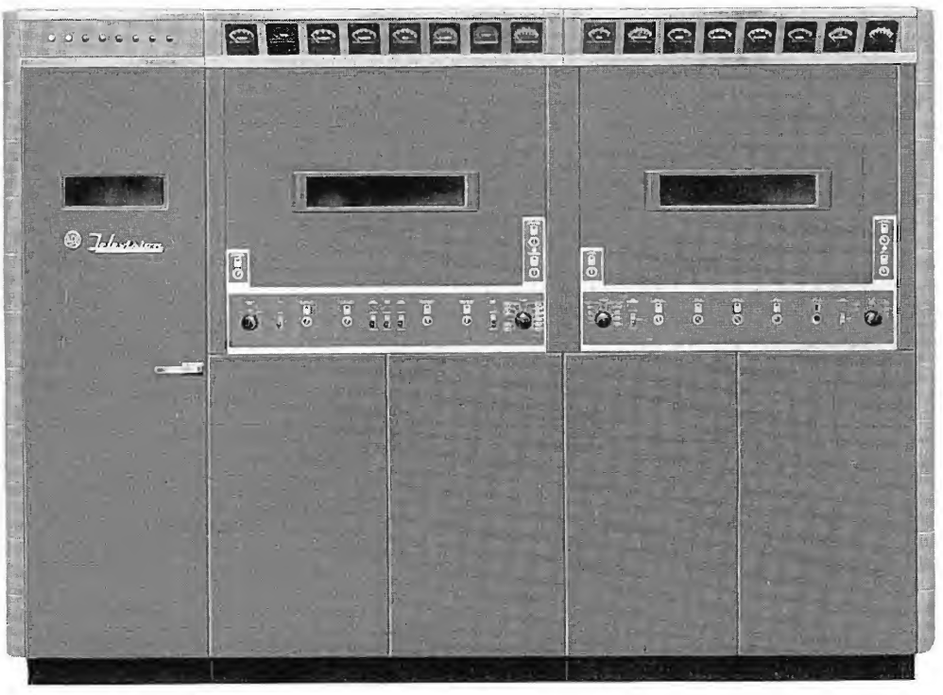


FIG. 1. A front view of the 6-kw transmitter shows that all of the status lights are grouped near the top of the control unit. The meters are illuminated by lights installed in the bottom of the meter panel making it possible to easily read all of the meters even where room lights have been dimmed for monitoring purposes.

Features

Design objectives that were established after a thorough study and which have been accomplished in these designs, are as follows:

(1) To make an appreciable reduction in the amount of floor area required for the transmitter—in particular, a reduction in the amount of equipment which must be located in the operating area.

(2) To simplify conversion from a low power level to a higher level with the maximum use of the original equipment. This requirement made modulation at the lowest power level of 2 kw essential.

(3) To design the equipment for color, linearity correctors were built in as part of the transmitter modulator thus allowing eventual elimination of this circuit in the stabilizing amplifier. Inter-carrier frequency control was also included which accurately maintains the frequency separation of the aural and visual carriers.

(4) To provide for remote control. Although this type of operation is not yet authorized for domestic service it is necessary, for economic reasons, to expect a given transmitter design to last for many years. It was decided, therefore, to include as part of the transmitter all the circuits which would allow it to be completely controlled from a remote location when operated in conjunction with commercial remote control equipment. Accordingly, meter shunts and external terminals are included not only for the meters required by the FCC but also in the cathode circuit of all of the power amplifier tubes above 50 watts rating. In addition, motors are provided for controlling the power output of both the visual and the aural transmitters. In the visual transmitter this includes motor control of video gain, pedestal level, and r-f excitation to the modulated amplifier.

(5) To design the transmitter shielding so that the r-f radiation from the cabinet is at a minimum in keeping with the recent FCC requirements on this subject.

(6) To keep operating cost to a minimum. The RCA 5762 air cooled triode was therefore selected for the final amplifier of the 6 kw transmitter as well as for the 25 kw unit. This tube has given consistently long life in both RCA FM transmitters and 25 kw VHF amplifiers.

Perhaps the most radical departure from previous convention is the cabinetry of the 2 and 6 kw equipments. To realize an appreciable reduction in floor area some fundamental changes in construction were thus indicated.

Space Reduction

Figure 2 shows a comparison between the general floor plan of these transmitters and a typical TV transmitter currently in use. Although it does not necessarily represent the method by which the final design was arrived at, it does show the fundamental reduction in the floor area that has been achieved. Figure 2A is the outline of a conventional transmitter consisting of a group of racks arranged in a straight line. Clearance is required in the front and rear of these racks for access purposes.

It can be shown that at least 50 per cent of a TV transmitter consists of switchgear, blowers, rectifiers, transformers and filters. It is not necessary that these items be visible or even readily accessible from the operating position. They then can be moved to the rear as shown in Fig. 2B. It has also been found that these larger components normally require access from only one direction. The rear of these racks can then be mounted directly against the wall with a saving in floor area as shown by the shadowed area.

The clearance area in the rear of the control and r-f units can now be combined with the clearance required for the front of the rectifiers and blower, into a combined aisle as shown in Fig. 2C, resulting in a further saving of floor space. Figure 3 shows the last steps in the evolution of the TT-6AL transmitter. The doors were removed from the rear of the r-f unit and from the front of the rectifier units and a single enclosure formed with a door at one end. The design was further simplified and accessibility improved by eliminating the rectifier racks and mounting the rectifier tubes on the rear wall of the enclosure and the large transformer and filter components directly on the floor.

A typical floor plan for the TT-6AL transmitter is shown in Fig. 3. Although the complete transmitter is housed in what is equivalent to a single cabinet, the equipment can be broken down for shipping into racks and panels of convenient size for easy handling. The rear wall of the transmitter contains no access doors or components so that this side can be mounted directly against the wall of the room. Where space is limited, the right side of the enclosure can also be mounted against the building wall, provided an opening for the air intake is made in the wall opposite the air filter.

Unusual Flexibility

It has been conventional in the past to arrange the circuits of a TV transmitter so that the visual transmitter is on one

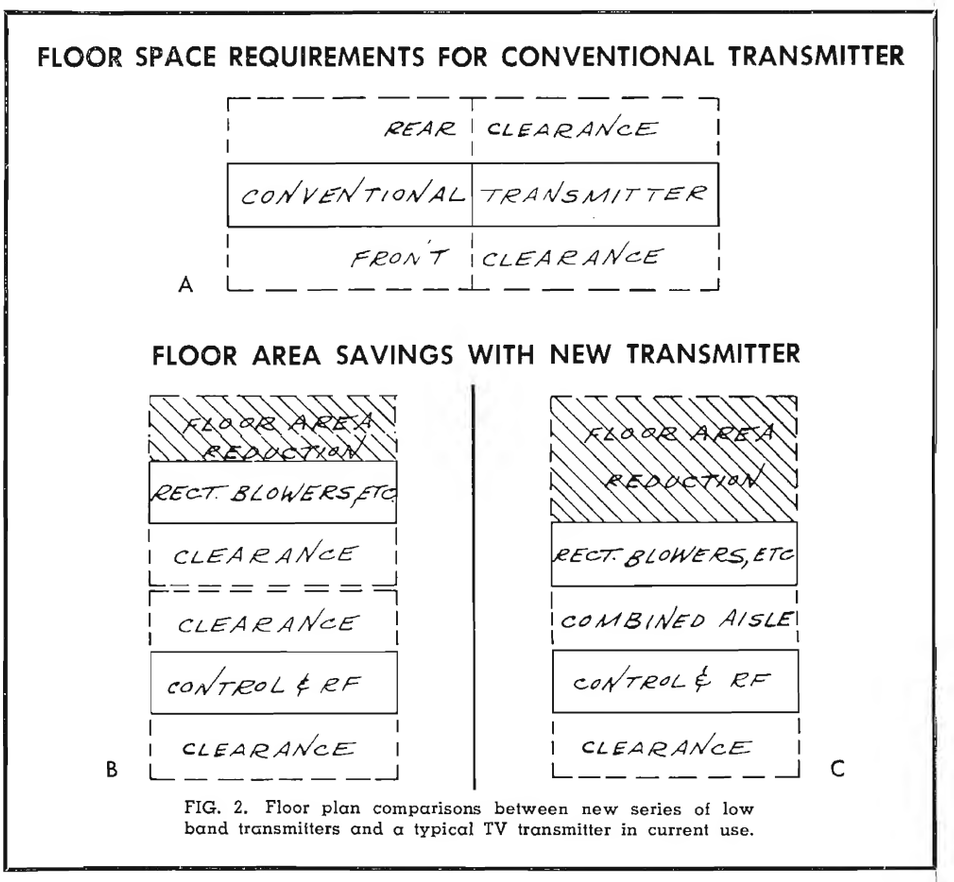


FIG. 2. Floor plan comparisons between new series of low band transmitters and a typical TV transmitter in current use.

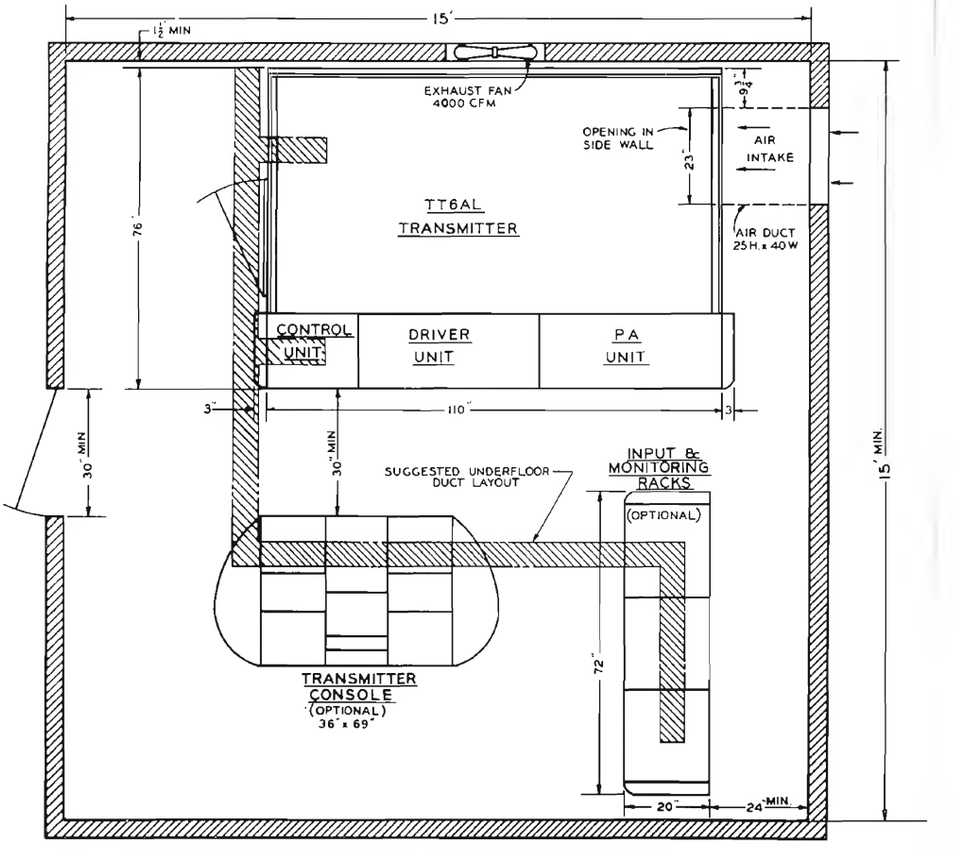


FIG. 3. One possible arrangement of the TT-6AL transmitter showing equivalent of single cabinet housing.

end and the aural transmitter is on the other. In the TT-6AL note the departure from this convention. The combined control unit for both the visual and the aural transmitter is located on the left-hand end of the front row of racks. To the right of the control unit the driver unit or 2 kw unit is located. This rack contains both the aural and visual drivers as well as the exciter and modulator units and is essentially the r-f and video circuitry of the complete 2-kw transmitter. The right-hand rack contains both the aural and the visual amplifier units.

Figure 4 illustrates the flexibility of the TT-6AL transmitter. This arrangement is of particular importance where space in the operating room is very limited. Doors have been added to the rear of the control and r-f racks and a front wall added to the rectifier enclosure. Since this rectifier enclosure contains no meters, operating controls or circuits requiring adjustments, it can be conveniently located in an adjacent room or in the basement. A further advantage of this arrangement is that the remote location of the blower will result in a reduction in the amount of noise in the operating room.

Another arrangement, designed primarily for remote operation is possible where a console is not used. Here, a suggested location for the remote control racks would be adjacent to the control unit. The input and monitoring racks would then be mounted at the opposite end of the transmitter and in line, thus reducing the size of the room required to house the transmitter and at the same time simplifying the inter-unit wiring.

The TT-2BL transmitter is similar to the 6-kw transmitter except for a reduction in the front line length. In fact, the control unit, the r-f unit, rectifier assembly on the rear wall, and the end panels are identical to those items used on the TT-6AL. Only some of the larger components such as the high voltage transformers, filter assemblies and the blower are different. The large number of identical items makes it convenient and economical for a broadcaster to start out with a 2-kw transmitter and at a later date increase his power to 6 kw with a minimum outlay.

Figure 5 shows the TT-25CL transmitter which consists essentially of the TT-6AL serving as a driver for our present 25 kw amplifiers. A comparison between the floor area required for the TT-25CL and the previous design shows a saving in floor area of approximately 15 per cent. All of the savings in floor area is brought about by a reduction in the size of the driver unit.

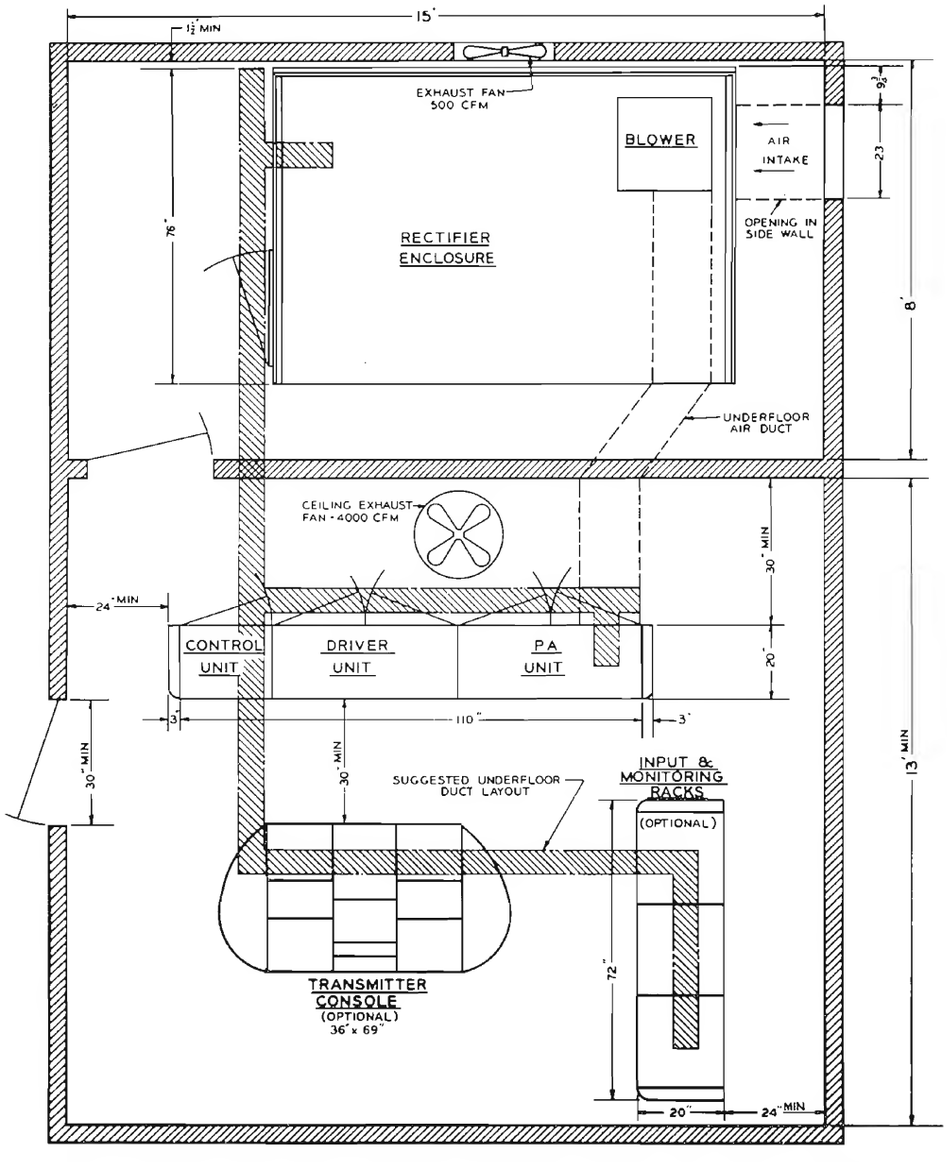


FIG. 4. Alternative floor plan of TT-6AL for use where operating room space is limited.

Fewer Power Supplies

Thermostatically controlled heaters under the covers keep the base of the rectifier tubes, which are located on the rear wall of the enclosure shown in Fig. 10, warm at ambient temperatures as low as 0 deg. C. A thermostatically controlled blower cools these tubes when the ambient temperature exceeds a predetermined value.

Wherever possible the same d-c power supplies are used for both the visual and aural amplifiers. This greatly reduces the number of components in the transmitter and allows operation of the complete equipment with only 5 power supplies including the exciter supply. The plate transformer for the 3,600-volt high voltage supply actually consists of three single-phase units connected in a three-phase full-wave circuit. The relatively small size of this single-phase unit greatly simplifies the handling problem.

Common Visual and Aural Exciter

A block diagram of the common visual and aural exciter unit and its power supply is shown in Fig. 11. The visual chain is shown at the bottom. Note that two separate crystal oscillators are used. Either oscillator can be selected from a remote location by a relay which switches the plate voltage to the proper tube.

Another feature is the use of a buffer amplifier immediately following the crystal oscillators. This allows operation of the oscillators with a very low r-f voltage on

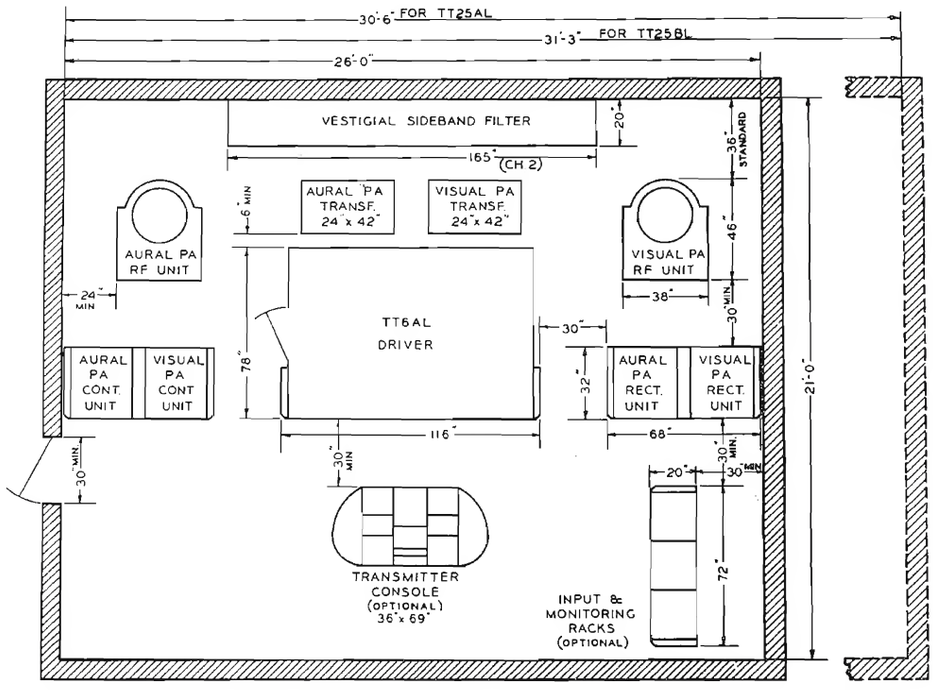


FIG. 5. This arrangement illustrates the space requirements of the TT-25CL transmitter.

the crystal. Since one of the major causes of frequency drift in a crystal controlled oscillator is heating of the crystal due to excessive r-f voltage these oscillators are inherently very stable.

Accurate Frequency Control

The aural chain starts off with a 6V6 master oscillator frequency modulated by two reactance tubes and followed by a series of multipliers and amplifiers, which are identical to those used in the visual chain. The circuitry making up the frequency control for the aural master oscillator is designed to accurately maintain the frequency difference between the aural and visual carriers.

A small amount of the energy from the aural and visual oscillators is fed to a mixer tube. When the aural oscillator is on frequency the output of this mixer will be 1/12 of the frequency difference between the aural and visual carriers on 375 kc. This 375-kc signal combines with the output of a crystal oscillator in a second mixer. The sum of these two frequencies is then fed to a chain of three dividers with a total division of 100. This amount of division is necessary to reduce the swing at the frequency detector to a point where the carrier will not drop out under any normal conditions of modulation of the aural transmitter.

A crystal control reference frequency is also fed to the frequency detector. By making the same crystal oscillator serve both as the heterodyne oscillator and as the frequency reference source, very accurate control of the inter-carrier frequency can be obtained. Three dividers with a total division of 80 are employed in the reference frequency circuit. The frequency detector is essentially a balanced modulator with a d-c component in the output which will change polarity depending upon whether the signal frequency is above or below the reference frequency circuit. This d-c voltage is fed back to the reactance tubes in such a way as to correct the frequency of the master oscillator.

When the frequency of the master oscillator has been corrected so that the signal frequency and the reference frequency at the detector are the same, the frequency detector then functions as a phase detector. The operation of this circuit differs from a conventional discriminator in that no error in frequency is necessary in order for

FIG. 6. Control unit is shown with door open. Auxiliary switches are located on the panel in the center. Above this panel are all the overload relays as well as the auxiliary relays associated with the overload recycling circuit.

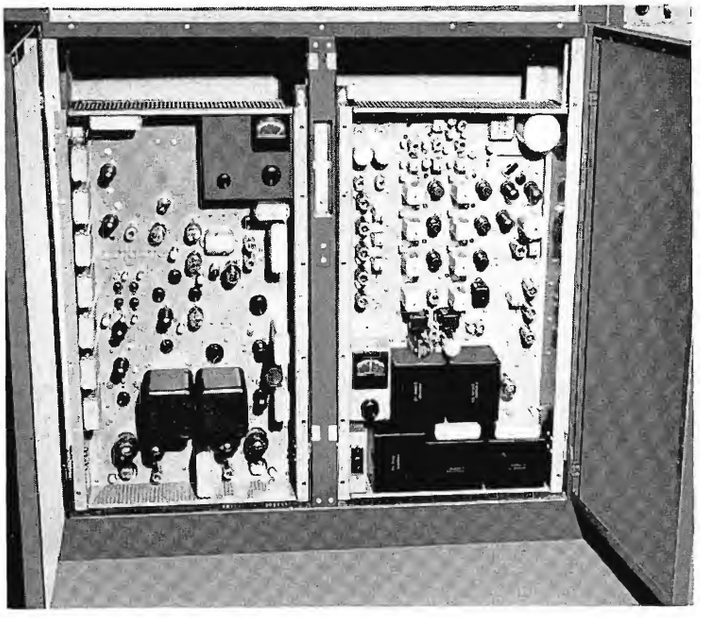


FIG. 7. Lower half of the 2-kw driver rack with the lower access doors open, showing the combined visual and aural exciter unit which can be seen on the left and the modulator on the right.

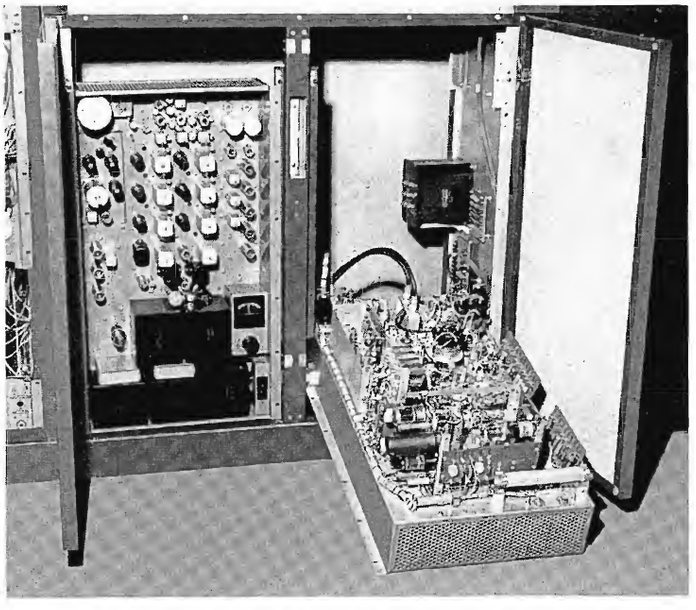


FIG. 8. The modulator unit is hinged at the bottom allowing it to be tilted forward for servicing.

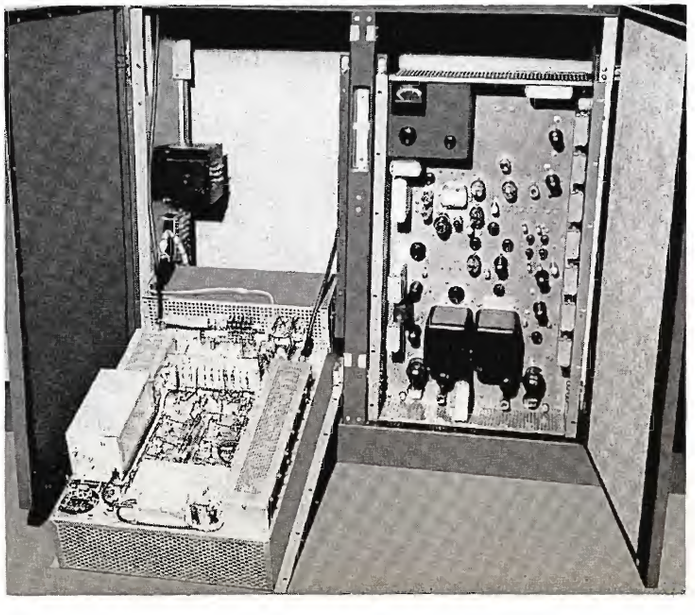


FIG. 9. Exciter unit tilted forward for servicing. No exposed circuits of the exciter chassis contain voltages above 350 volts. Thus, no interlocking is required.

a correction voltage to exist at the reactance tubes. The error of the difference frequency is therefore a function of and directly proportional to the accuracy of the reference crystal oscillator. This means that the difference frequency between the aural and visual carriers can easily be held to several hundred cycles, even without a temperature controlled crystal in the reference-oscillator circuit.

A frequency-interlock circuit is included and can be connected either to an alarm or to the transmitter-interlock circuit and thus prevent application of plate power to the amplifiers until the frequency control circuits are locked in. This type of frequency circuit has several inherent advantages in addition to the accuracy of frequency control. The tuning of the frequency control circuit is the same for all channels and therefore can be preset at the factory before the equipment is shipped.

In the event of a failure in the frequency control circuit the master oscillator can be switched to manual frequency control. This oscillator is inherently quite stable and will maintain its frequency within tolerance for long periods of time after it has once warmed up. While the master oscillator is being manually controlled the frequency control circuit can be serviced and program continuity maintained.

Minimum Tube Cost

The 2-kw transmitter is shown in the block diagram of Fig. 12. Note that in an effort to keep tube cost to a minimum the tubes in the visual and aural chain are different. The visual chain consists of three stages ending with a grid-modulated 6076 tube while the aural chain consists of only two stages ending with a 4-1000A tube.

In the 6-kw transmitter the r-f circuit is the same as that used in the 2-kw transmitter except that two 5762 tubes operating in a grounded grid linear amplifier circuit have been added to the visual chain and a single 5762 tube added to the aural chain.

Built-in Linearity Correction

A block diagram of the modulator unit is shown in Fig. 13. Note that two stages of approximately unity gain have been included to provide for linearity correction. The output stage is a high efficiency shunt-regulated cathode follower. Back porch clamping is employed. Sync for the clamp circuit is separated at a low level and amplified in a separate chain of tubes thus providing reliable clamping even with a very degraded input signal.

The signal is clamped in two stages; therefore, any hum which may be present on the input signal will be greatly reduced in the modulator. This together with the fact that the linearity correction circuits are built into the modulator may, in many cases, eliminate the necessity for a stabilizing amplifier at the transmitter location. It will be noted from the block diagram that the monitor amplifier can be switched to many parts of the circuit, greatly aiding in making adjustments and in servicing.

Unattended Operation

A simplified schematic of the carrier-off monitor unit is shown in Fig. 15. This is a protective device and is being offered as optional equipment and is of particular value for unattended operation. It is also being recommended for use with RCA 25 kw and 50 kw amplifiers. It is essentially a comparison device and functions from information supplied by the two reflectometer units.

When used with the 25-kw or 50-kw transmitters it will compare the voltages from the output reflectometer and the driver reflectometer. As long as the input and output of the amplifiers are propor-

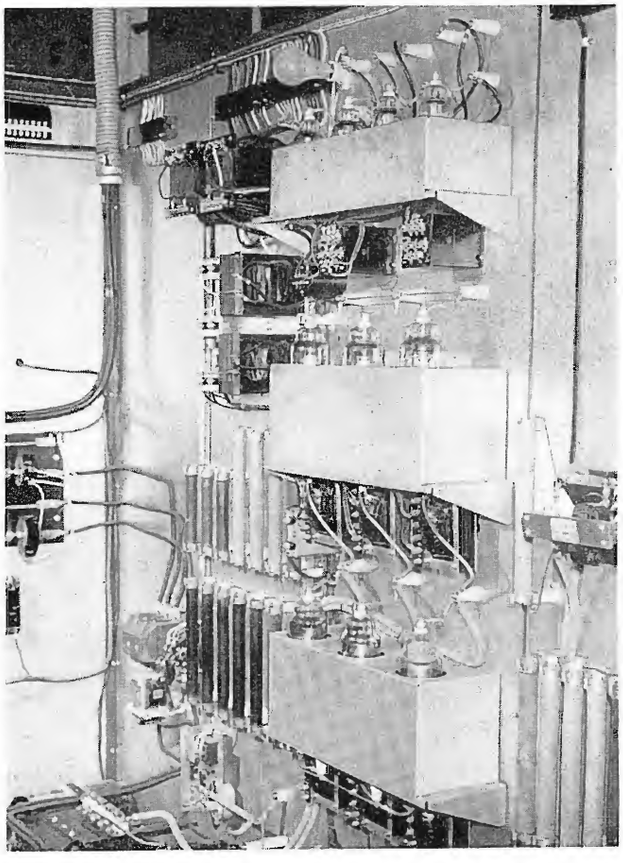


FIG. 10. View of the rear wall of the transmitter enclosure showing the rectifier tubes and thermostatically controlled heaters under the covers.

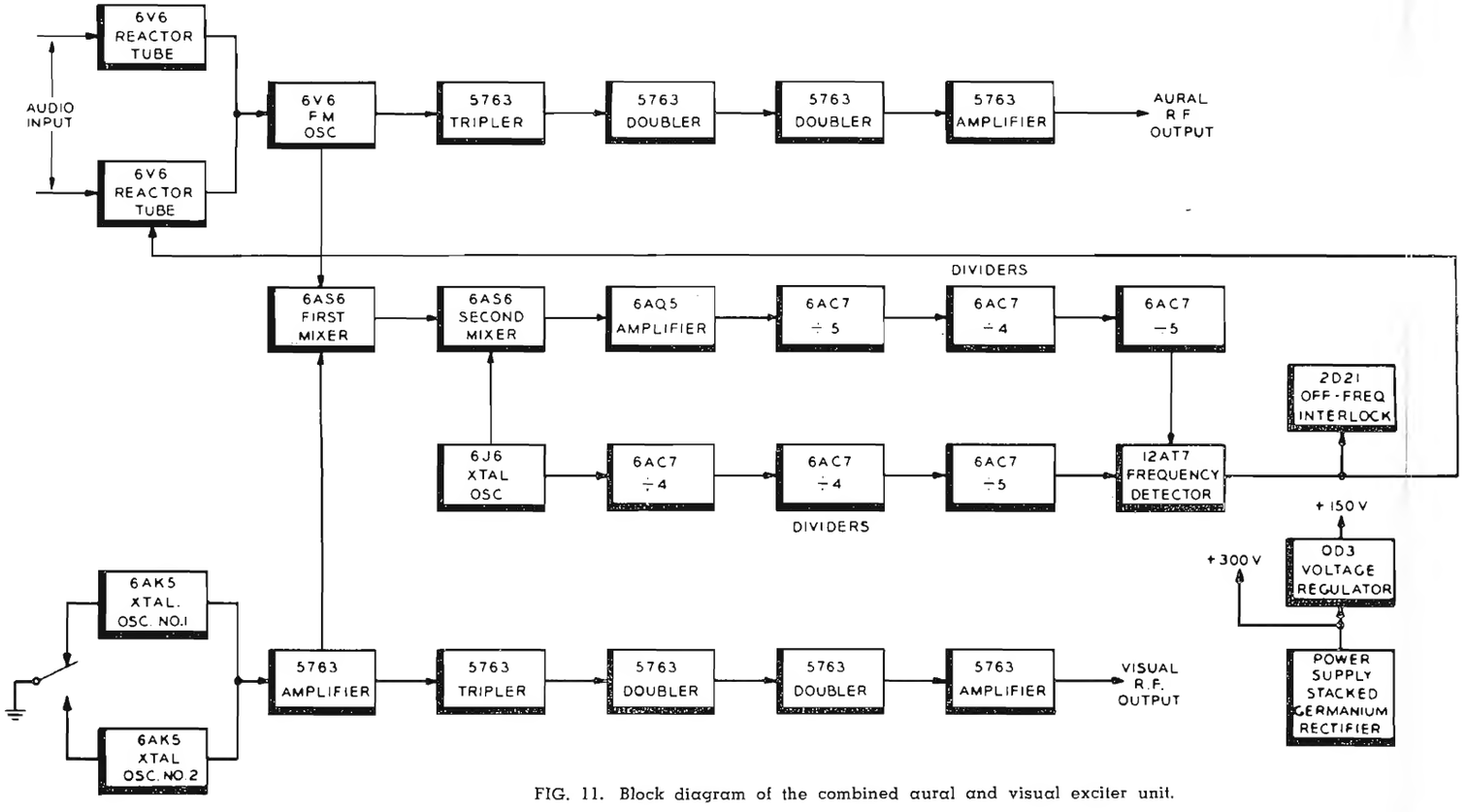


FIG. 11. Block diagram of the combined aural and visual exciter unit.

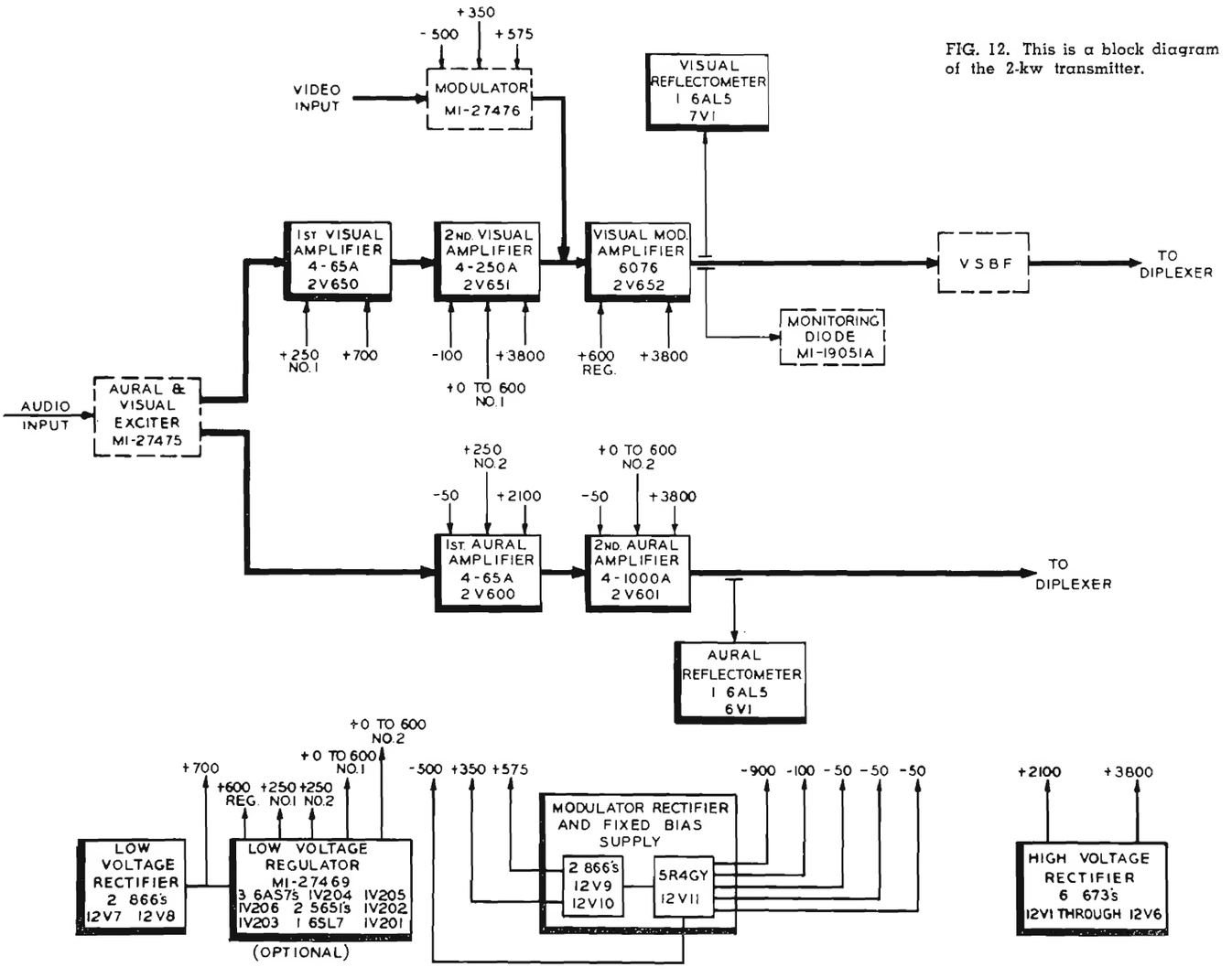


FIG. 12. This is a block diagram of the 2-kw transmitter.

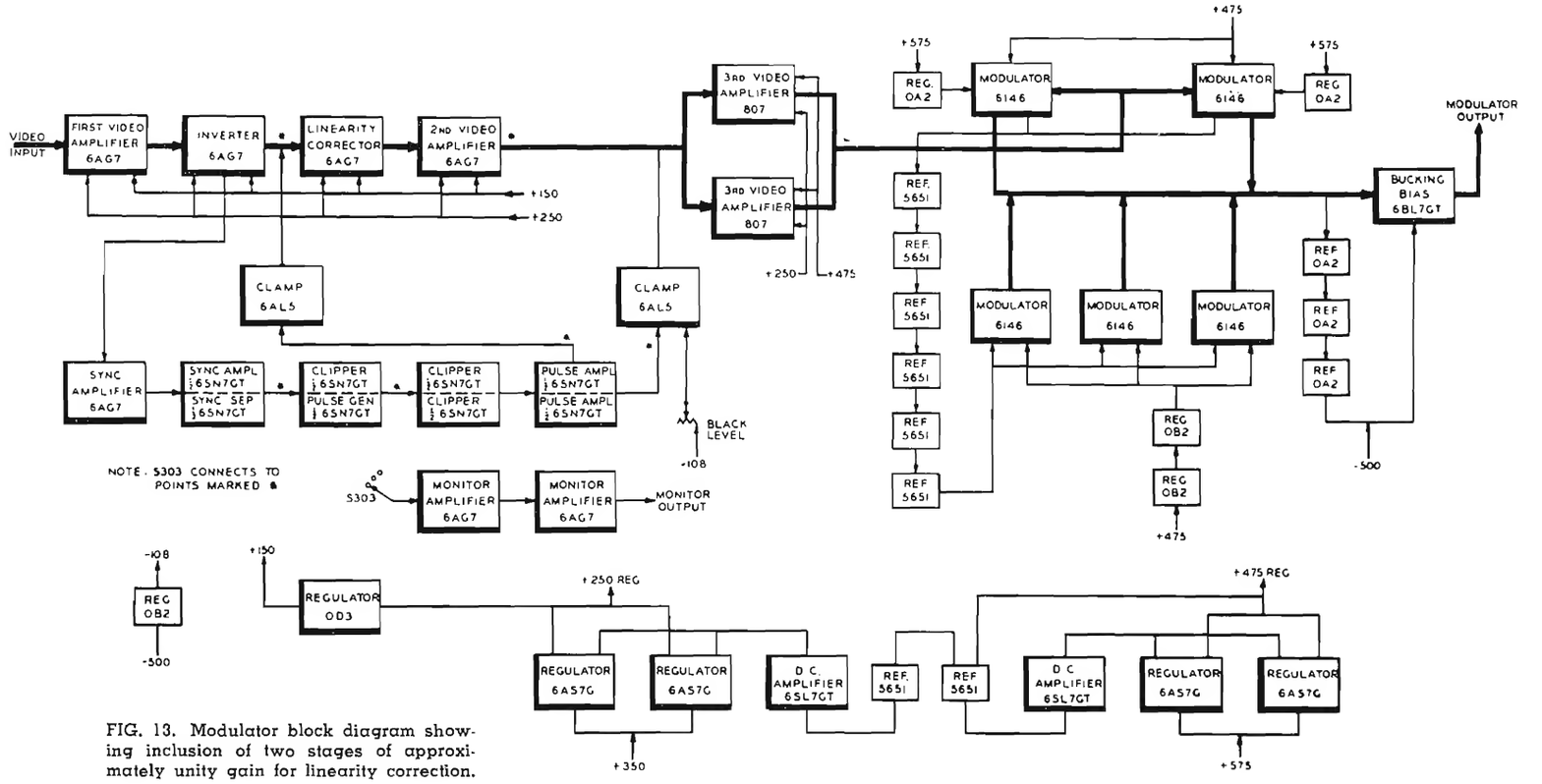


FIG. 13. Modulator block diagram showing inclusion of two stages of approximately unity gain for linearity correction.

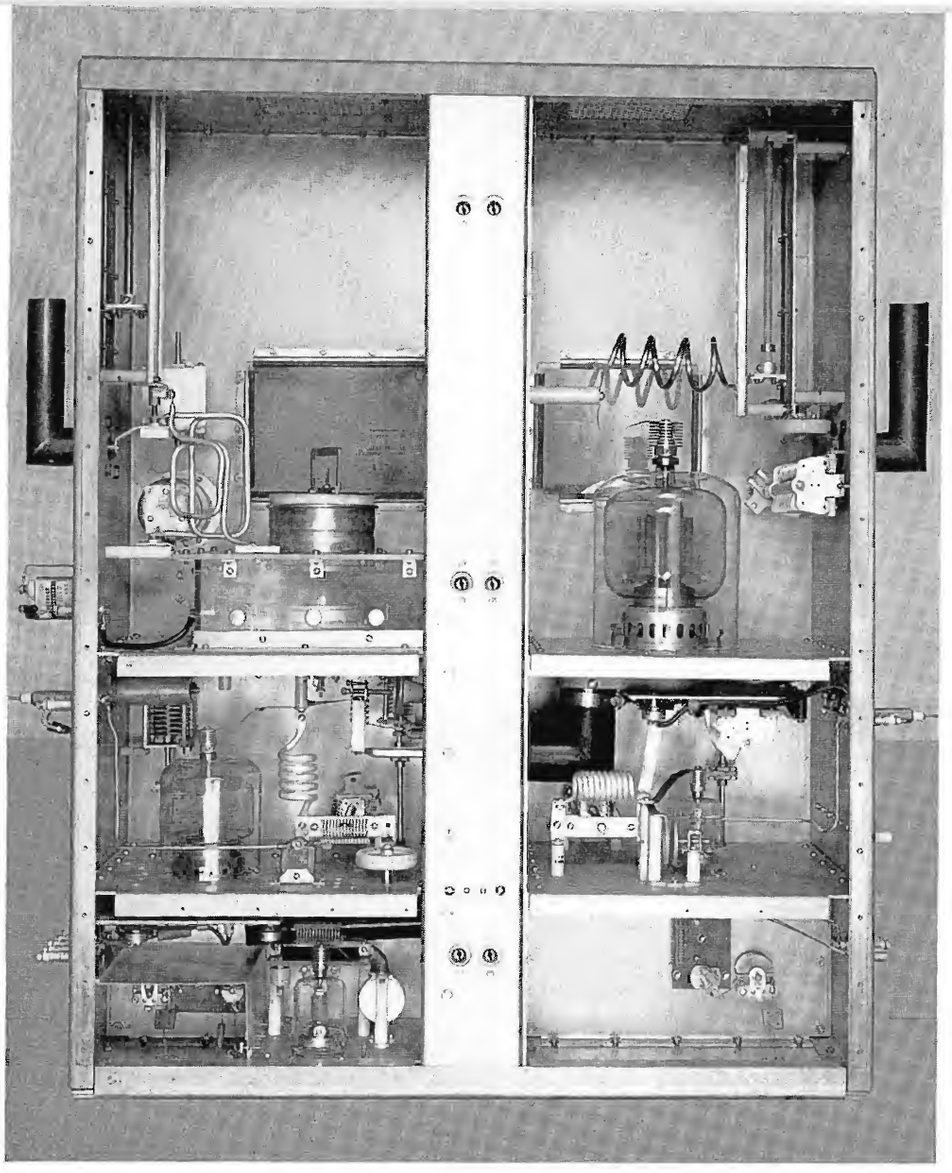


FIG. 14. Rear view of the 2-kw r-f unit showing the visual chain on the left and aural chain on the right.

tional to a preset value the monitor will not operate. In the event of an r-f arc inside the amplifier circuit which, in a broadband amplifier does not necessarily detune the circuit enough to operate the overload relays in the cathode circuits of the tubes, this balance will be upset. The monitor will then operate and the relay in its cathode circuit will trip the transmitter interlock. If desired, this unit can also be connected to compare the output of the reflectometer to a d-c voltage or to the output of the modulator. In the latter case, it will of course be necessary to connect to a circuit in the modulator where the d-c components are maintained.

Thus, these new space-saving RCA VHF transmitters represent the answer to medium power low band requirements. A simple power increase resulting from a minimum of changes converts the TT-6AL transmitter for 25-kw operation. The departure from standard design concept, insofar as cabinetry is concerned, has yielded an appreciable and valuable saving in space.

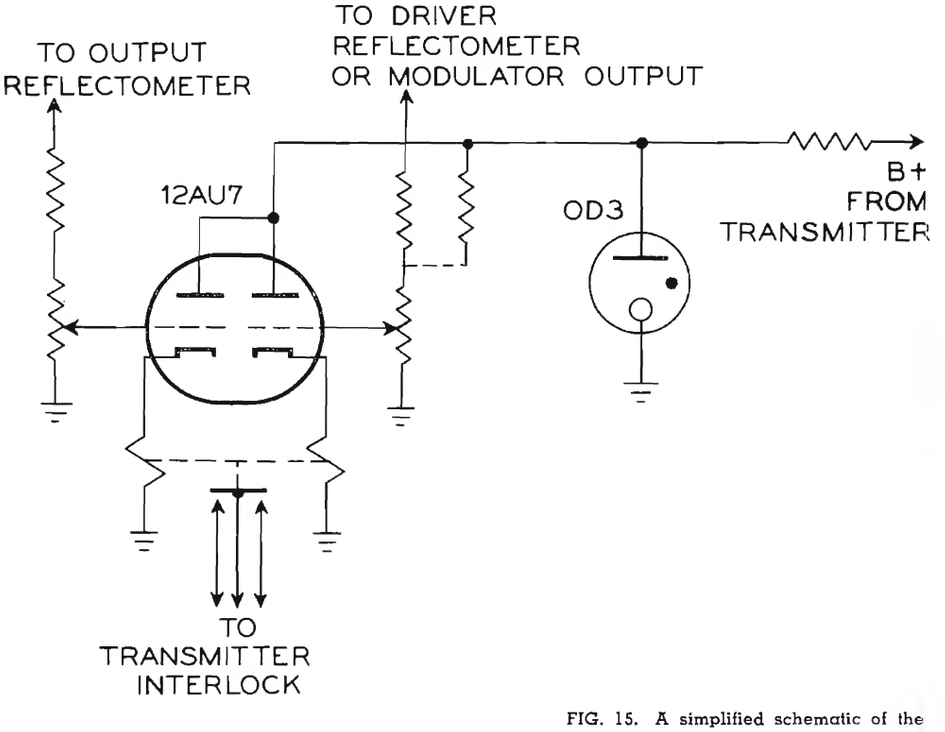


FIG. 15. A simplified schematic of the carrier-off monitor unit.

TV and the

Pioneer St. Louis ETV Station Tackles Teacher-Classroom

by PAUL A. GREENMEYER, *Managing Editor, BROADCAST NEWS*
and
LOUIS T. IGLEHART, *Director of Public Relations, KETC*

KETC, St. Louis's educational TV station, is one of the pioneers engaged in a vast evaluation program to find the exact place of television as an aid to education. It is an exceptional example of cooperation, involving two higher educational institutions — Washington University and St. Louis University — and some fifty different school systems, both public and parochial.

As a non-profit community-supported institution, KETC derives its financial support from Mr. Average Citizen, various school systems, private foundations and industrial corporations. Local commercial radio and TV stations are lending support to the experiment. The two metropolitan daily newspapers — the *Globe-Democrat* and the *Post-Dispatch* — and the St. Louis Public Library are also among its chief supporters.

An impressive list of solid accomplishments in the station's first year and a half of operation includes: substantial enrichment of the St. Louis primary grades' curriculum through direct school program service; production of a record number of first-rate programs for national distribution through the Educational Television and Radio Center; development of a new TV programming concept for children at home; and the presentation of an excellent array of music, drama, art, and public affairs programs for its adult viewing audience.

In addition, several college-level courses have been offered for credit, including a course in algebra and trigonometry for "up-grading" engineers in local industrial plants. In the advanced planning stage is a proposed "College of the Air", in which a complete two-year Liberal Arts curriculum would be offered as a joint project involving Washington University, St. Louis University and KETC.

Station Management

Governing body of this non-profit enterprise is the St. Louis Educational Television Commission — a group of St. Louisans prominent in the fields of education, civic affairs, business, and labor. The Commission has placed full administrative responsibility on the station management. It makes programming decisions, usually in consultations with specialists, and it sets budgets for Commission approval.

At the outset, management of KETC was put in the hands of men with experience in the production end of commercial television. This experience has been of great value to the station operation. But the management of an educational station involves a balancing of resources and purposes remote from commercial TV. Hence the Commission decided that an Executive Director should be appointed for the station with the administrative experience and additional orientation required for the head of an educational institution. A station operations manager with professional experience in television production was appointed to be responsible to the director.

In September 1955, the Commission announced the appointment of Arthur H. Compton, former chancellor of Washington University, as Executive Director; and George L. Arms, formerly of KUHT, Houston, Texas, as Operations Manager. Arms' top operational management team consists of Clair R. Tettemer (former TV producer of "Ohio School of the Air" at Ohio State University), Director of School Programs; Jack A. Chenoweth (formerly with WLW-TV), Chief Engineer and Facilities Supervisor; and Vincent Park, promoted from KETC Senior Producer to Production Supervisor.

Crisis in Education

Shortage and Gives Engineer-Starved Industry Imaginative Boost

Photo Credits: Paul J. Adams, KETC Staff Photographer

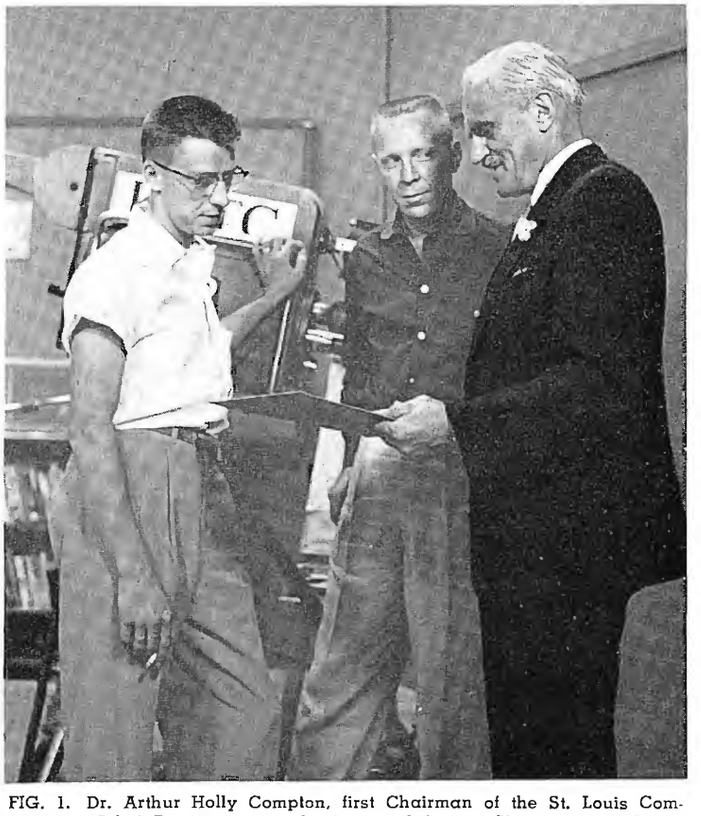


FIG. 1. Dr. Arthur Holly Compton, first Chairman of the St. Louis Commission, Nobel Prize winning physicist and former Chancellor of Washington University, said on accepting appointment as Executive Director of KETC: "It is the challenge of the effectiveness of TV in shaping American thought that induces me to turn my prime efforts toward its use."

FIG. 2. George L. Arms (left), KETC Operations Manager, and Clair Tettemer, Director of School Programs, meet on Channel 9 set to discuss KETC's fall school programs. Teachers polled indicated that all 14 of KETC's school program series made "a contribution to the learning situation over and above what the teacher was doing in the classroom."

KETC's Manager, George L. Arms, an educational television veteran has expressed strong feelings about the role of television as an aid to education. Typical of his direct and incisive comments are these excerpts from his speech delivered to several large St. Louis civic and service organizations:

"Television is new. Its national impact has been within the last five years. It is expensive. It is technically imperfect. It has certain arbitrary limitations. But we know this much about television. Students learn as much from televised instruction as they do in a conventional classroom. Not always; not in every subject and not at every level; but in enough subjects and at enough levels to invoke the feeling that television can be used as a major educative tool.

"Now let us be accurate. We do not hold that formal education by television is a replacement for, nor equivalent to the traditional educational ideal of a teacher working closely with a small group of students. But when the ideal is unattainable, we must do something more than to lament the good old days.

"Does anyone seriously think that we can double the number of college classrooms in fifteen years? Does anyone seriously think we can double the number of trained faculty members in fifteen years? Let's be realistic and plan to meet the challenge of the coming years with the new resources of the coming years.

"Let us remember: if an educational television station obviates the necessity for the construction of one major building on a college campus it has paid for the cost of its installation and operation for five years.

"This is basically an administrative problem. Students are not going to storm the academic bastions demanding that college courses be put on television; Academicians are not going to demand the right of exposure to the thousands instead of the tens; and educational television station operators themselves are in no position to bring pressure to bear for this kind of evolution. But most of the key experiments have already been made. It has been competently demonstrated that this kind of educational television is academically sound, and physically workable. We now need immediate recognition of the implications by key administrators who have the willingness to orient their school systems, college or state organization to a continued series of controlled experiments in various areas. Then as the pressures mount from grade to grade television and education alike will be ready to meet the expansion needed at each level.

"Who says educational television is expensive? Education is expensive. Television is expensive. But education and television together offer the only economically probable way to meet the floods of youngsters that are storming the doors of our schools and colleges with anything more than a raised palm and a pious look towards the nearest state legislature. We have predicated an important aspect of our American democracy on the right to an education. We can continue to meet our obligations, if we get education on television. Is it not about time we got started?"

Crisis in Education

The Commission has been studying possible uses of TV in connection with the serious educational crisis developing from a rising birth rate and growing teacher shortage. It has been estimated that 8,000,000 more students must be accommodated by 1960. In order to maintain present student-teacher ratios it would be necessary in a few years for one-half of all college graduates to become teachers. Research done recently, however, has shown that students can learn some subjects as well over television as in the actual presence of the teacher. In attacking this problem, the Commission proposed to the Fund for the Advancement of Education that support be given to some imaginative and systematic experimentation on a large scale to determine how television might be used effectively in schools.

The Commission made it clear that this is not a proposal to replace all live teachers with elecronic instruments. In some subjects the role of the classroom teacher might be revised to the leading of students in discussion, based on lectures and demonstrations which have been transmitted by TV. It gives the teacher more time for counseling and for personal work. It multiplies the range of the teacher's service a hundredfold.

To assist in solution of this problem the Fund for Advancement of Education made a grant to the Commission of $95,000 for the teaching of three experimental courses on the high school and elementary school levels. The Fund said, "We feel this demonstration in St. Louis is likely to have far-reaching implications for American education." This project is being carried on in addition to KETC's regular school program service.

TV Teaching Project

School Program Director Tettemer says of this project financed by the Ford Foundation, "The results of direct teaching to large groups by television are being comprehensively evaluated. Teachers working on this project have been released by the school system for this specific purpose so that the planning and presentation of these television lessons is their major assignment for the year. Three courses are being tested in this experiment — second grade spelling, ninth grade English composition, and ninth grade general science."

The evaluation program is being carried on to answer such questions as:

Can large groups be taught by television as effectively as by standard classroom methods?

What are the difficulties in the handling of these large groups?

What are the limitations of teaching by television?

Students participating in this program are assigned to a television experimental group or a standard classroom controlled group. The experimental and controlled groups have been matched according to IQ, socio-economic background, reading level, and educational.

The television classroom size ran up to 150 in one room. These groups watched the television lessons on four 24-inch direct viewing sets. The sets were mounted on special stands and auxiliary speakers were installed. This gave every student a clear view of at least two sets.

The Fund for the Advancement of Education grant for carrying out this project was received in the summer of 1955. Planning and preparation took several months and the experiment officially started February 8, 1956. The final results will be available early in 1957.

School Program Service

Apart from this special evaluation project, KETC maintains a sustaining and varied direct program service to schools in the St. Louis area. Television sets have been installed in several hundred elementary and secondary schools in the metropolitan area. These include public, parochial and independent schools in the City and surrounding counties in Missouri, plus several counties across the Mississippi River in Illinois. During the school year, KETC broadcasts programs primarily for reception in the schools. These programs can be received in homes since they are broadcast on Channel 9. The responsibility for these school programs rests solely with the educators in the St. Louis area. Groups of teachers from the schools plan, prepare and present these programs. The station furnishes the staff for the production of the television programs.

Each series has a television teacher who appears on all programs. Since the job requires personality as well as knowledge, these teachers are selected by competitive auditions. The best TV teacher is the one who combines a pleasing personality with an expert visual presentation of a subject.

The school program service supplements the regular classroom instruction and, therefore, enriches the curriculum. Through the power of TV, children in hundreds of schools are simultaneously given experiences they could not have by any other means. They take field trips, witness

FIG. 3. Starting September 24, KETC will telecast programs exclusively for the schools from 9 a.m. to 3 p.m. continuously five days a week.

FIG. 4. Programming scope at KETC is great, ranging from puppets for pre-school children to college-level credit telecourses for adults.

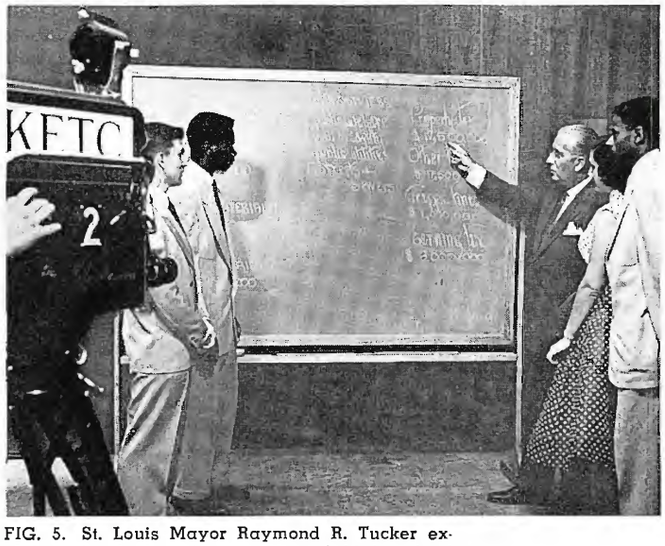


FIG. 5. St. Louis Mayor Raymond R. Tucker explains city budget to a group of high school students on KETC public affairs programs.

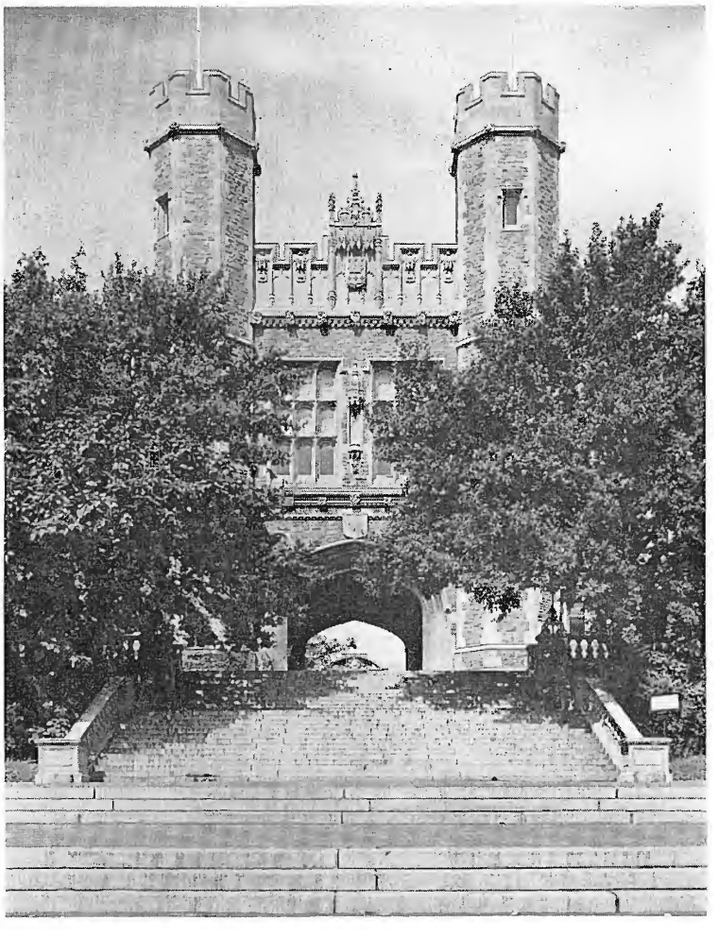


FIG. 6. Brookings Hall of Washington University. The university gave the use of its land on the northwest corner of the campus for new KETC studio building.

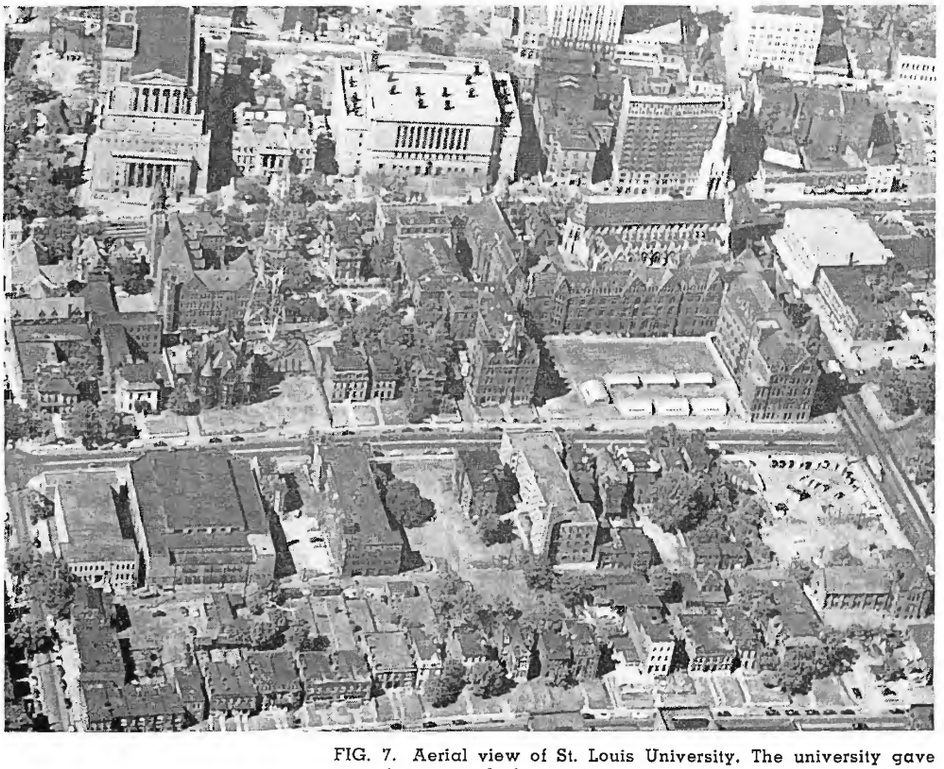


FIG. 7. Aerial view of St. Louis University. The university gave use of its grounds for erection of KETC transmitter and antenna.

scientific demonstrations, hear fine music, and listen to good literature. Television gives every school and every student a great new window to the world.

College of the Air Plan

Perhaps the most challenging of the projects envisioned by KETC is the proposed "College of the Air". Under this plan, a complete liberal arts curriculum for the first two years of college would be offered over television. Students successfully completing the courses would be eligible for the degree of "Associate in Arts".

The stated purposes of such an undertaking are revealing: "To enlarge the opportunities for higher education . . . for those unable to enroll in college immediately after high school . . . for interested and qualified adults, and for those who might otherwise be excluded . . . because of shortages in teaching personnel and physical facilities . . . and to operate as a 'pilot experiment' that may be of service in other parts of America."

KETC Manager George Arms emphasized the nature of the undertaking when he stated, "This is not a move to replace the teacher, to abandon the campus, or to lower educational standards. It is an attempt to assess the possible role of television in meeting the impending crisis caused by teacher and classroom shortage.

"We do not know how well, or even whether, it will work, but we do feel that it offers a splendid chance to evaluate television's effectiveness in helping to provide adequate educational opportunity in a democratic society."

A Joint Committee representing Washington University, St. Louis University, and KETC has submitted a proposal to the Fund for the Advancement of Education requesting funds to underwrite this experiment for a six year period. Many difficult problems inherent in such an ambitious undertaking were discussed and ironed out by the representatives to this Joint Committee. The range of problems, academic and administrative, was vast: Registration procedure, transfer of credits; mutually acceptable curriculum; amount of supplemental classroom, laboratory and residence requirements; criteria for selection of faculty (involving teachers from both universities in addition to visiting lecturers of national prominence); relation of "College of the Air" to traditional university administration and control; etc.

There was a remarkable display of cooperation and agreement between the two universities on these critical issues. The

FIG. 8. A class of Emerson Electric Company employees views with attention a KETC college mathematics telecast in company's offices. The five-credit freshman course for on-the-job training was inaugurated in an effort to help fill the nation's critical shortage of engineers. Over 100 employees viewed 45-minute lectures in college algebra and trigonometry four days each week. Once a week an instructor met with groups of around 20 students for a problem-working laboratory session.

joint proposal was prepared in final form in a relatively short time as a result of this harmony and the final action now rests with the Fund for the Advancement of Education. Once the experiment is under way, the eyes of the academic world, indeed of every American interested in the future of education, will be focused on St. Louis and KETC.

KETC and the Emerson Experiment

Earlier this year, KETC initiated another educational project with far reaching implications. In cooperation with the Department of Mathematics of Washington University, a five hour credit course in algebra and trigonometry was telecast for a small but important basic audience. The "students" were 121 employees of Emerson Electric Company. They attended "classes" during regular working hours in special rooms provided for them at Emerson's St. Louis plants. Their tuition was paid by the company.

Four days a week they viewed 45 minute lectures presented on KETC by Washington University's Professor Ross R. Middlemiss. On Tuesday of each week Professor Middlemiss met with his pupils at the plant for personal help, consultation, quizzes, and examinations. The course was the University's basic freshman course, Math 115, undiluted in scope and content and running for a full semester. Practically all of the students who began the course went through the entire semester.

How did this remarkable experiment come about? KETC's George Arms says, "I had been casting about for a specific project which could demonstrate educational television's usefulness to the St. Louis industrial community. Due to the critical shortage of trained engineers with which all technical industries are faced, I thought this might be the field where we could prove most helpful. The Washington University Mathematics Department and Emerson Electric Company responded immediately to the proposal. Within a week after my initial contact, we were underway with our first TV credit course for industry."

On-the-Job TV Training

This unique method of helping industry cope with its trained engineer shortage attracted widespread attention, especially among other firms faced with the same problem. On the basis of the interest expressed it is expected that KETC will re-schedule this course and perhaps others in the fall with many more companies participating in what has become known as the "Emerson Experiment".

FIG. 9. Though not equipped to do remotes, a Navy Panther jet fighter was transported to the KETC studio parking lot for live show telecast.

Station Equipment

The station operates on Channel 9, with a 5-KW RCA TT-5A transmitter and an effective radiated power of 30,000 watts. Its signal covers a radius of approximately 50 miles, serving a population of some two million people.

Two field cameras, type TK-11, are used for both studio and remote pickup. The control equipment includes two field monitors, one film control unit, one field type master monitor and a field type switcher.

A 600-foot Ideco triangular tower is located on some of the highest ground in the area. It is topped by an RCA Type TF-6AH 6-bay superturnstile antenna. (This is the bottom half of a 12-bay antenna so that the other 6-bay section can easily be added for expansion to higher power.)

FIG. 10. RCA TT-5A transmitter showing input equipment. Earl Nelson operator.

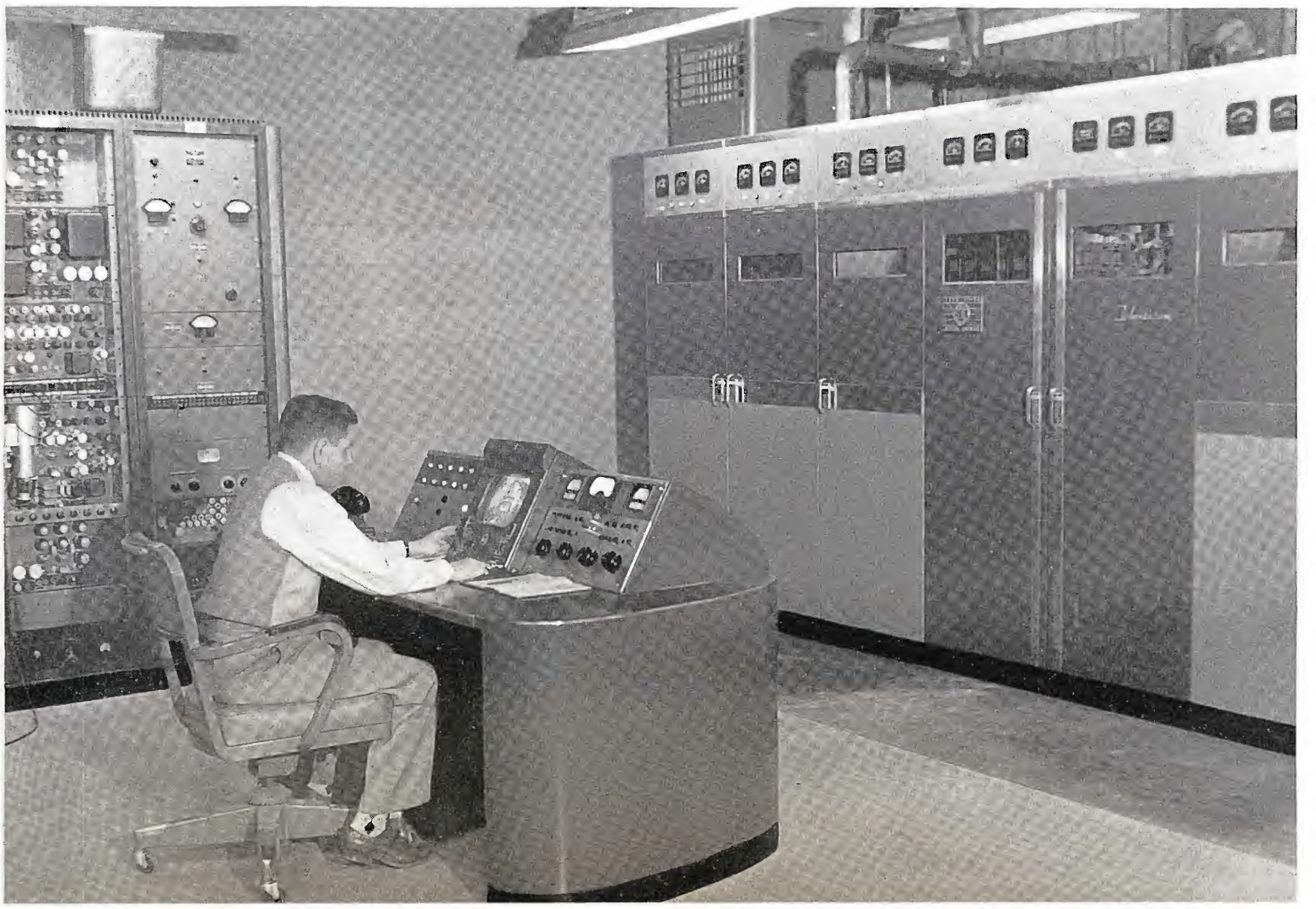
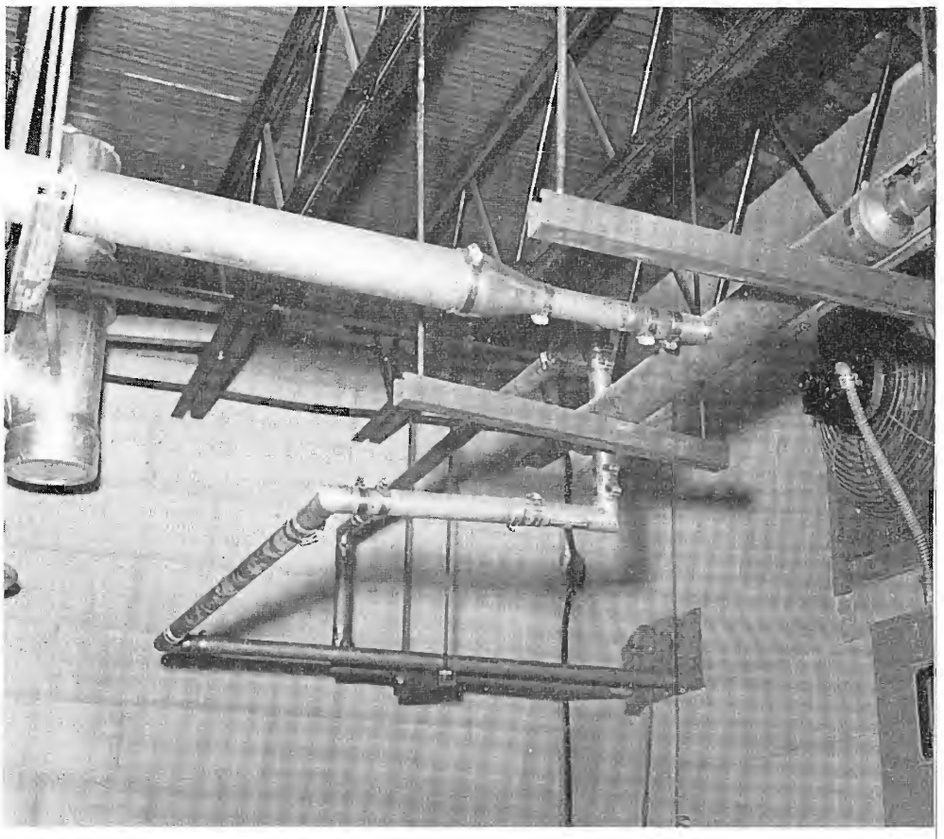


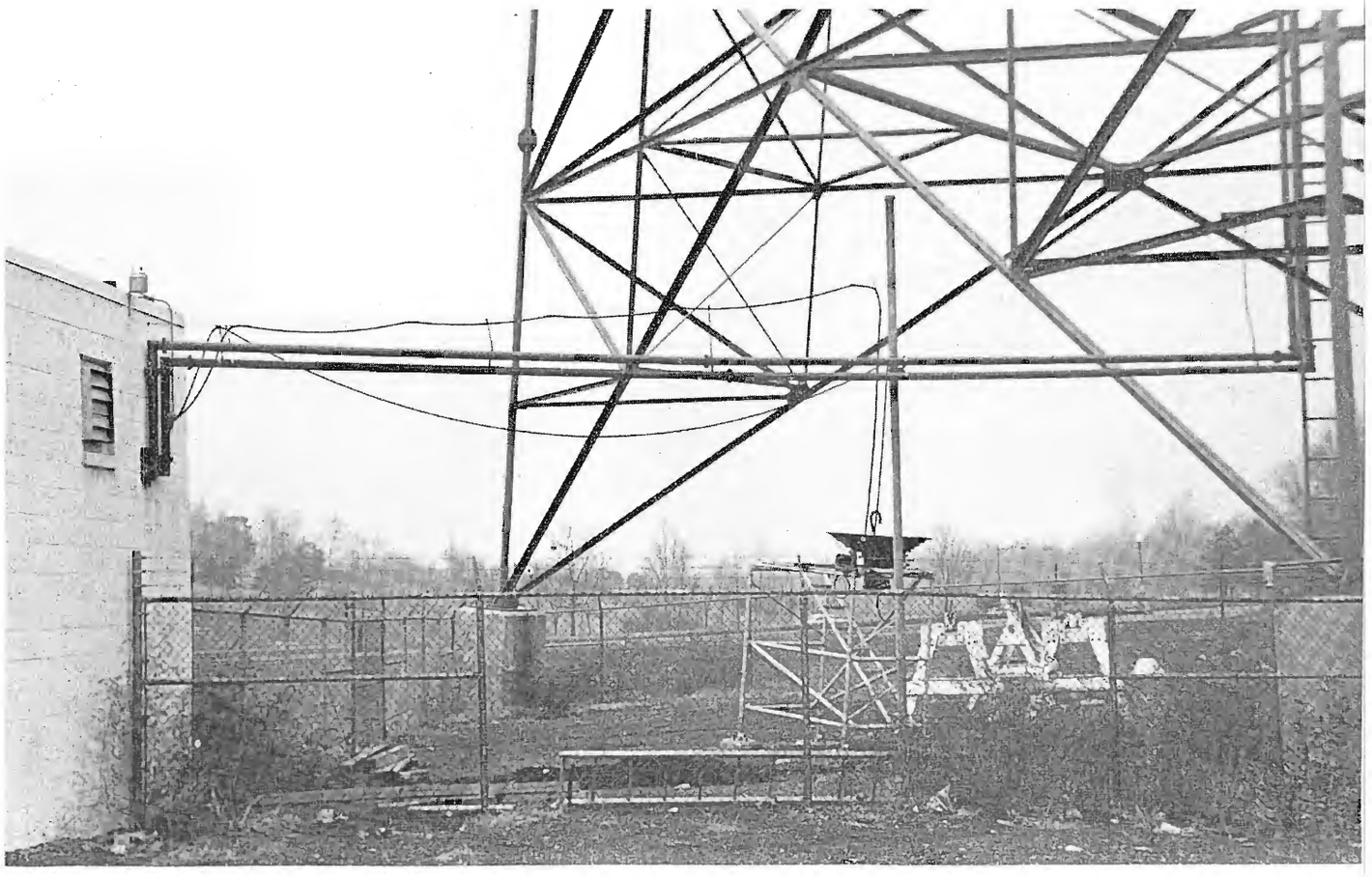
FIG. 11. View at rear of transmitter showing mounting of diplexer and phasing section. 1⅝" transmission line was used for construction of phasing section. All other line is 3⅛" Teflon.



Transmitter Building

This is on the grounds of the St. Louis University several miles from the studio building. RCA microwave equipment is used for the link from the studio to the transmitter. The transmitter building features one large room in which is installed the 5-KW transmitter (Fig. 10). The sideband filter and diplexer are mounted behind the transmitter (Fig. 11). The control console is directly in front of the transmitter. At the left of the control console is rack-mounted equipment and microwave terminating equipment. At the right of the control console is space for an engineering work bench used for maintenance and repair work. Here also are shelves for storing tubes and spare parts.

FIG. 12. View of base of transmitting tower showing microwave receiver antenna mounted to pick up signal from passive reflector mounted on tower.



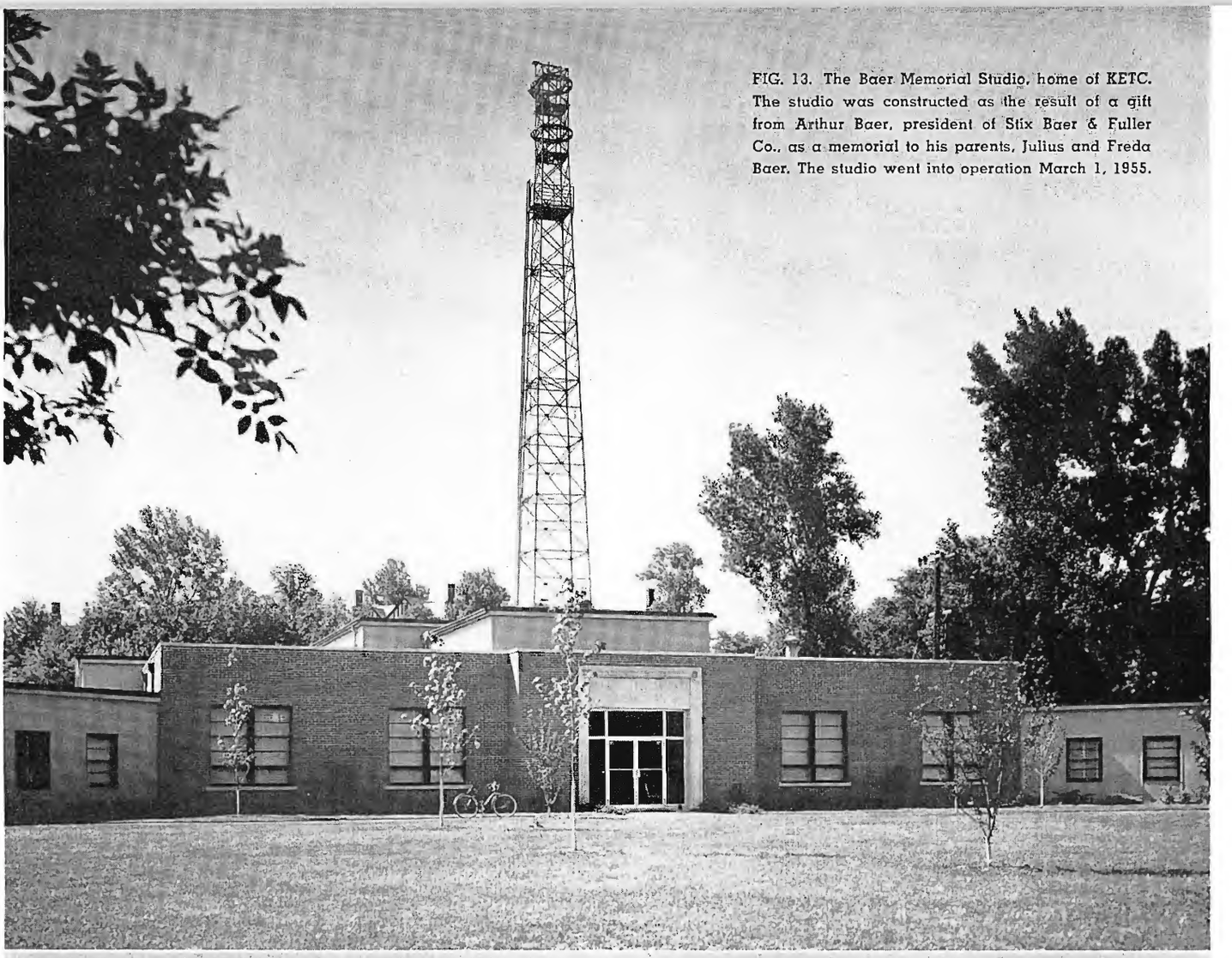
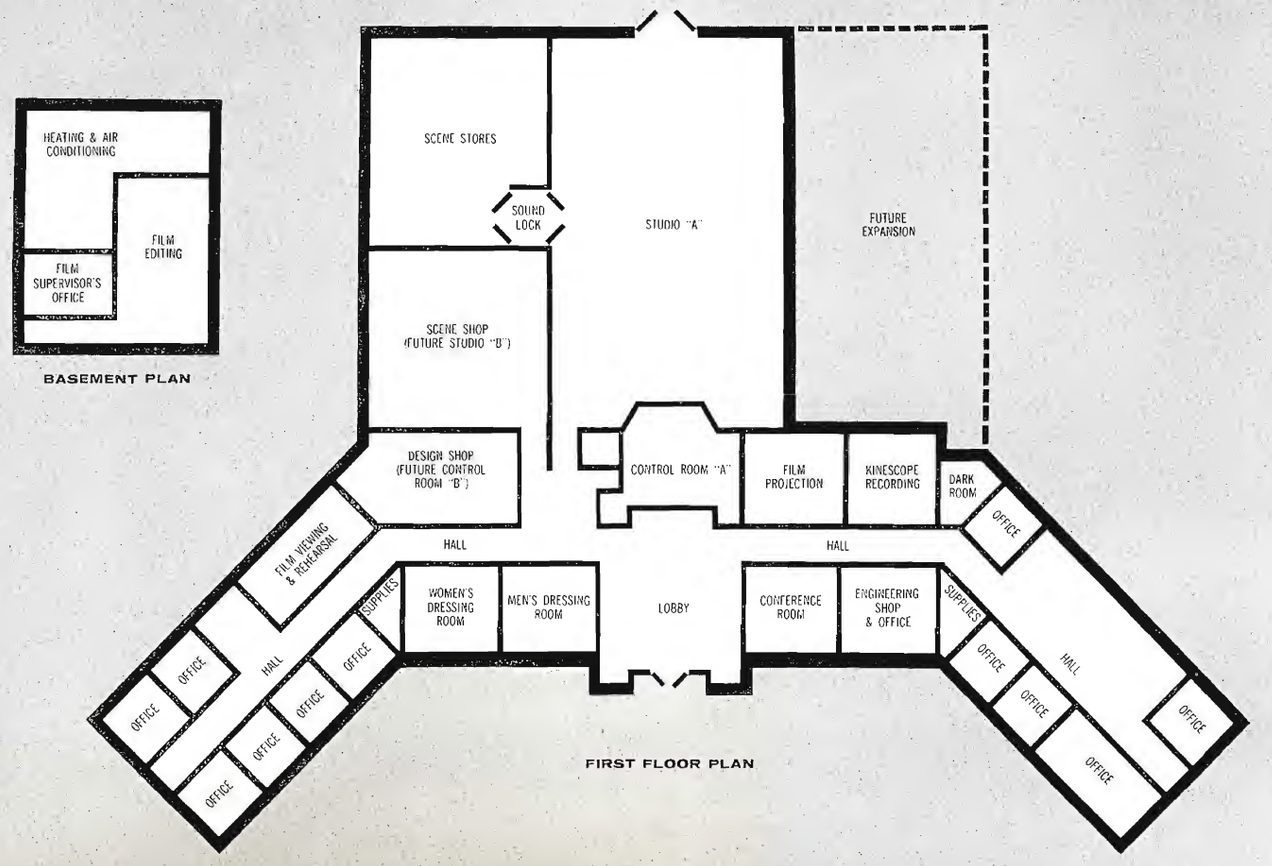


FIG. 13. The Baer Memorial Studio, home of KETC. The studio was constructed as the result of a gift from Arthur Baer, president of Stix Baer & Fuller Co., as a memorial to his parents, Julius and Freda Baer. The studio went into operation March 1, 1955.

FIG. 14. Floor plans of the Baer Memorial Studio, station KETC.



Main Building

A new building designed by Jack Chenoweth, Chief Engineer of KETC, was constructed recently on ground made available by Washington University. Called the Julius and Freda Baer Memorial, its construction was made possible by a grant from Arthur B. Baer, prominent St. Louis department store executive and strong booster of all KETC activities. Construction is economical in cost and generous in space due to the use of a unique product called Cemsteel. This is a panel type construction using cemesto board and light gauge steel. The facade of the building is of masonry construction. There are 15,000 square feet of floor space and the entire building is air conditioned.

The accompanying layout shows the numerous offices as well as studios and other facilities and room for expansion that have been incorporated in the structure.

Studio

In the studio the acoustics problem is solved by lining the ceiling and walls with fiber glass panels held in place with 'chicken wire.' Overhead tracks carrying drapes of various colors allow the studio to be divided into three separate areas. There are several fixed sets, for example, the fireplace corner and a puppet stage. These fixed backgrounds can be covered by the drapes in order to change settings rapidly.

Studio Lighting

The studio lighting system was designed by Chief Engineer Chenoweth so that the master control can handle several shows at one time. Conventional lighting grids each accommodate a total of forty outlets which are operated by individual three-position toggle switches controlling relays. The outlets are divided into four groups of ten each and each group is controlled by two master switches. For example, a change can be made from high- to low-key lighting of any group by throwing one master off and the other on.

Complete lighting for a program can be preset by the individual switches and then the complete bank turned on by merely throwing a master switch. While one program is running, lights can be preset for another so that by turning one master off and the other on, it will completely light the second set.

Critical lights can be arranged and switches set in advance from the control position. The video operator can manipulate light switches by merely turning around. Eight different combinations are possible.

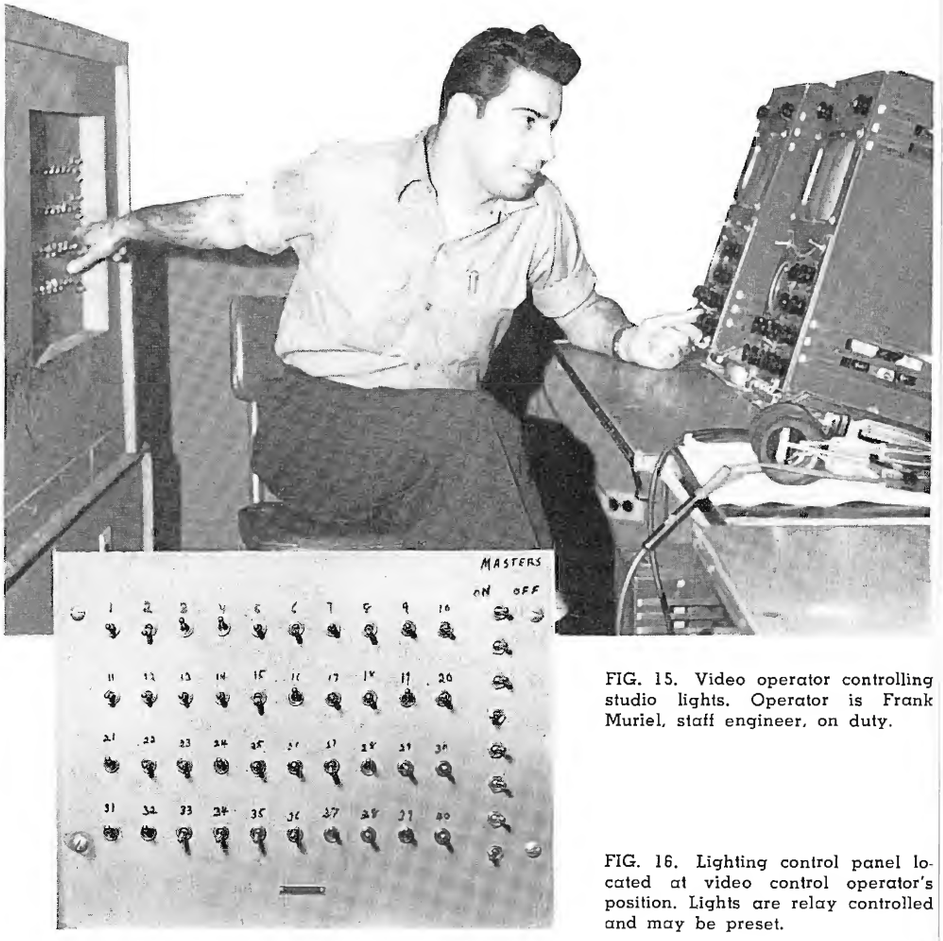


FIG. 15. Video operator controlling studio lights. Operator is Frank Muriel, staff engineer, on duty.

FIG. 16. Lighting control panel located at video control operator's position. Lights are relay controlled and may be preset.

FIG. 17. Part of light grid in studio to show unique conduit construction that supports lights and also carries wiring.

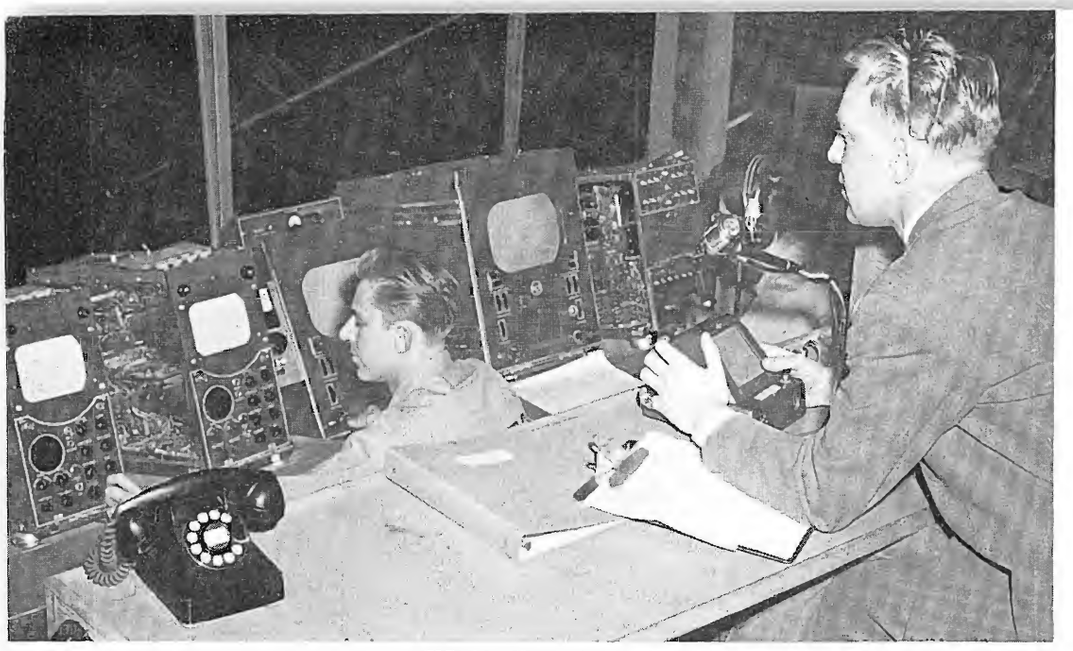


FIG. 18. View of control room showing video equipment—two field camera controls, auxiliary switcher, film camera control, master monitor and field switcher. Operators Carl Johnson (left) and Frank Muriel.

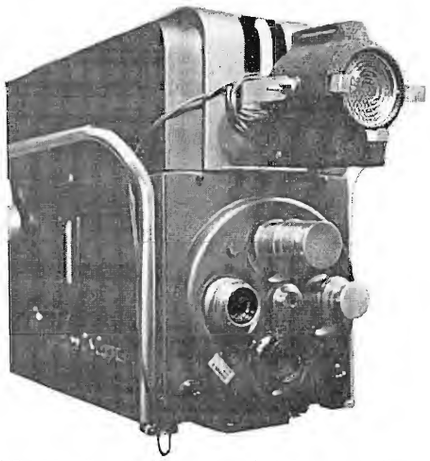


FIG. 19. Front of camera showing mounting of 3-inch Fresnel light used for filling eye shadows, illuminating studio cards, etc.

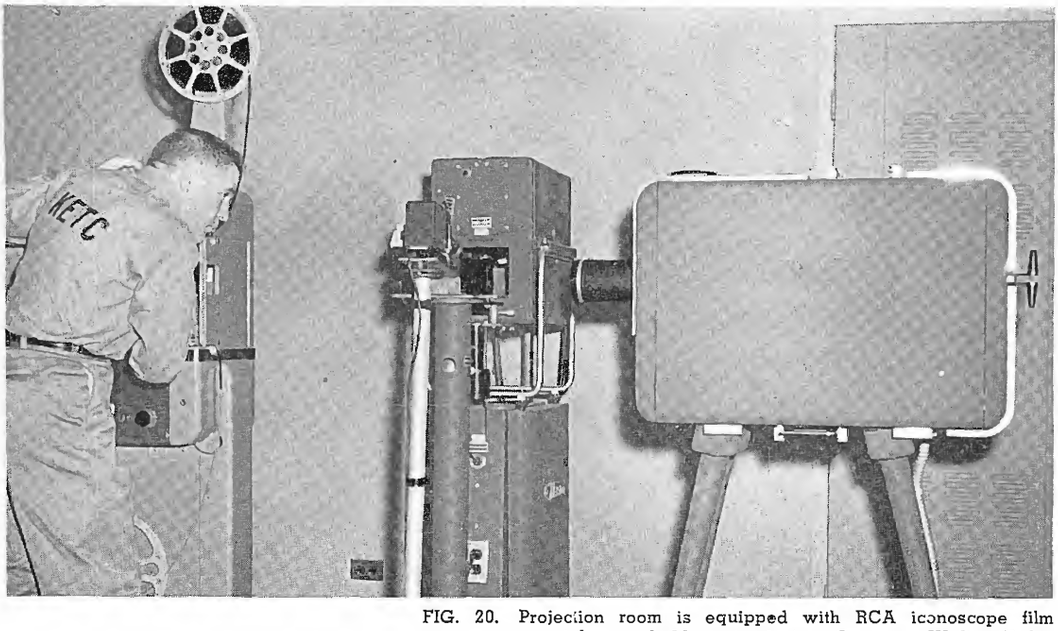


FIG. 20. Projection room is equipped with RCA iconoscope film camera, grey telop and 16mm projector. Operator Walter Dake.

FIG. 21. KETC film editing room with Dan Lovins at editing table.

The lighting grid was designed for low cost construction. It is built of 1¼-inch conduit that serves two purposes. It acts as support for the lights and it also carries the wiring. Receptacle boxes for outlets are built directly into the grid.

Thirty scoops and 15 spotlights are employed, also 12 banks of reflector floods designed by the station engineers. Each bank employs six reflector floods. In addition three-inch baby spots with 150-watt bulbs are mounted on the front of each TV camera above the turret. These are used for filling in on facials, closeups on cards, etc. The control switch is mounted on the back of the camera convenient to the operator's hand.

Studio Control

Station engineers built their own "bypass switcher". This enables them to feed film and announce booth directly to transmitter. It frees the studio camera, switcher and audio for rehearsal purposes while film programs are on the air. This bypass switcher operates rack-mounted relays to switch audio and video.

When the second studio is finished and completely equipped, the present field controls will be used for it. Rack studio type control equipment will be employed when proposed plans are consummated.

Projection Room

The projection room has two RCA TK-20 film chains together with 16mm, Telop and slide projection equipment. Complete editing facilities are available in the film department. A Moviola, ganged synchronizer and other equipment is available for handling double system motion picture footage on the three editing tables.

An animation stand constructed by the KETC staff is also available in the film department.

Kinescope Recording Room

Facilities for making either single or double system Kinescope recordings are available. During the past year over 500,000 feet of Kinescope were made at KETC.

The equipment consists of a G.P.L. recorder with a Maurer optical sound recorder for single system recordings. A Stancil-Hoffman 16mm magnetic film recorder is used for recording double system sound tracks.

Part in a National Network

Educational television stations such as KETC are affiliated with the Educational Television and Radio Center with headquarters in Ann Arbor, Michigan. The Center, supported principally by Ford Foundation funds, makes grants for the production of programs for distribution to all the member stations. In this way, the best programs produced in each city are distributed on Kinescope film to the others. During KETC's first year it assisted with the work of the Center by producing 11 series totaling 135 programs for national distribution. The Center now provides 20 educational TV stations with one hour of programming each evening. It is fulfilling the dream envisioned at the 1952 St. Louis conference for an educational television network bringing "the nation's greatest teachers and the finer elements of our culture into the living rooms of all our homes".

KETC and Film Center

Station Manager Arms says, "Station KETC has a $90,000 contract with the Center this year. The Center pays for programs and production costs plus kine recording costs. By this means KETC has been able to double its number of kinescope programs. Ordinarily, we would do about forty during 1956. With the assistance of the Center, we will do eighty."

A Budget for Education by Television

The operation of a TV station is a complex business. Even apparently simple forms of production such as the professional presentation of a series of lectures require the art of an able producer and a team of skilled technicians if the power of TV is to be used effectively in communicating with the general public. The basic operating budget of KETC is $250,000 annually with additional expenses authorized on the basis of grants received for special program production. Thus the total rate of expenditure during the first year has been about $300,000. The budget has been maintained at the same level for the present year.

The school systems base their contributions on a rate of approximately $1 per year per student. Such appropriations for the first year amounted to $137,000. Approximately $144,000 has been appropriated by the schools for the second year. Large sustaining gifts for the operating fund, mostly from St. Louis businesses, account for approximately $50,000 annually. Small gifts from individual citizens—"Sponsors of Channel 9"—obtained primarily from a year-round mail campaign, total about $10,000 annually.

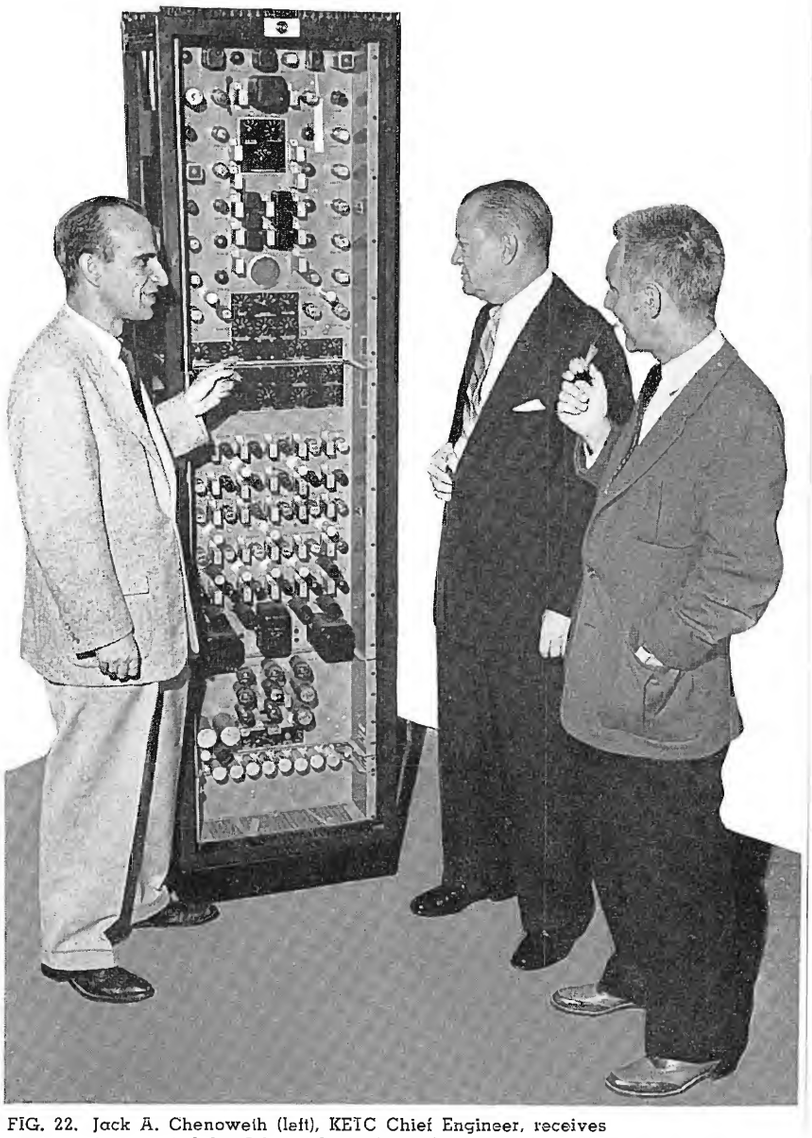


FIG. 22. Jack A. Chenoweth (left), KETC Chief Engineer, receives equipment presented by John Roberts (center), president of 800 North 12th, Inc. This gift was "a gratifying example of generous business support of a community-owned television station."

FIG. 23. Bill Martin, Jr., spinner of tales for the younger set, is featured in a weekly half-hour show, "The Storyteller." This series is kinescoped and will be distributed nationally.

FIG. 24. All KETC work, including telops and studio cards, is designed and created by staff artists David Kaskowitz (left) and Burton Dobinsky.

FIG. 25. Puppets used on children's programs are designed by Valerie Haynes. Val operates puppets and provides voices on "The Finder" show.

FIG. 26. Fred Conway, nationally prominent St. Louis artist, created a special mural depicting educational television as a community influence.

Operating under this budget, KETC continues to have the largest full-time paid staff of any educational TV station now on the air. Though salaries are necessarily modest, persons launching television careers have been attracted to educational TV because of the freedom it offers for experimentation in new forms of production. But the primary mission of KETC is, in Manager Arms' view, "To televise education. Within its budget the station can perform the service expected of it by the schools. It can broadcast college courses and programs that deal wisely and courageously with public issues and problems. In addition it can offer simply produced programs revealing what is best in music, books and the arts, and it can produce worthwhile children's programs."

Math 115 via TV

A significant by-product of the Emerson experiment has just recently emerged. Encouraged by the success of Professor Middlemiss' televised course, the Washington University Department of Mathematics made a bold decision. Beginning with the Fall Semester of 1956, all students who enroll in freshman mathematics will take their courses over television. The pattern will be roughly the same as followed in the Emerson experiment. Students may view their lectures either at home or in special TV classrooms on the campus. Special time will be provided for personal assistance, quizzes, tutorial sessions, and examinations. However, all freshman mathematics students will receive all their lectures by television from KETC. The entire course is being kinescope recorded in the KETC studios this summer by the senior members of Washington University's Mathematics Department—Professor Holbrook M. MacNeille, Professor H. Margaret Elliot, and Professor Middlemiss. They will be shown twice daily so that the student may conveniently fit them into the rest of his schedule. In announcing this forward-looking educational concept, Washington University said in the bulletin announcing the course that it "increases the opportunity for individual instruction and assistance and makes available to every student the department's most experienced and able teachers."

For the Future

Forward planning for programming and financing are inseparable and it is desirable that fund raising programs should stay at least a year ahead of broadcast operations. Also the building of a reserve for contingencies and additional equipment is essential. The eventual purchase of equipment for remote and color telecasting would enhance KETC's usefulness to the community in many ways in future years. While current program commitments must be balanced wih funds currently available, financial goals are being projected for the future which balance with the vast potentialities of this new medium.

KETC looks to the future with confidence, striving to improve its services to the community and anxious to widen its growing repuation as one of ETV's most active pioneers.

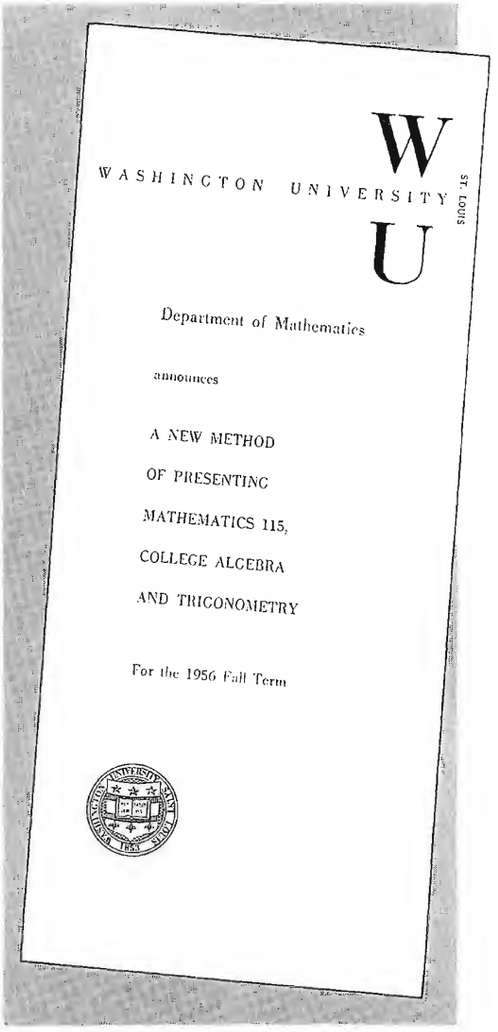
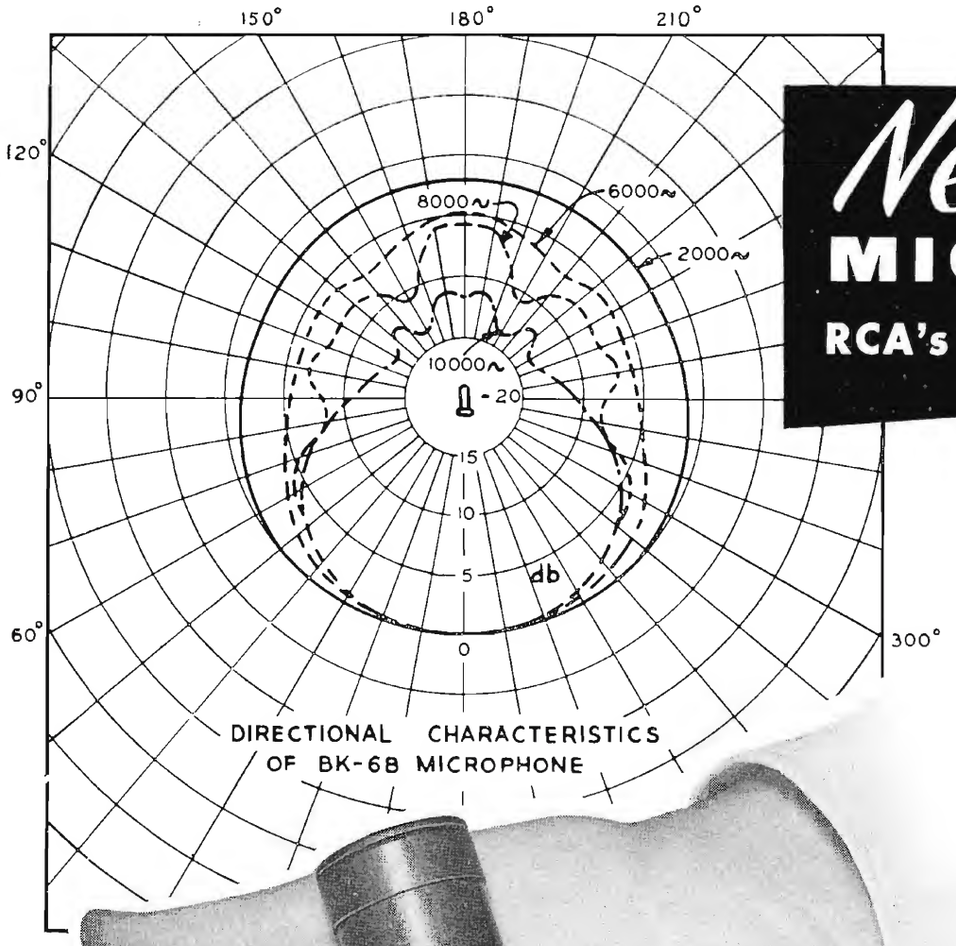


FIG. 27. Freshman mathematics via TV is offered by Washington University beginning fall 1956 with regular college credit.

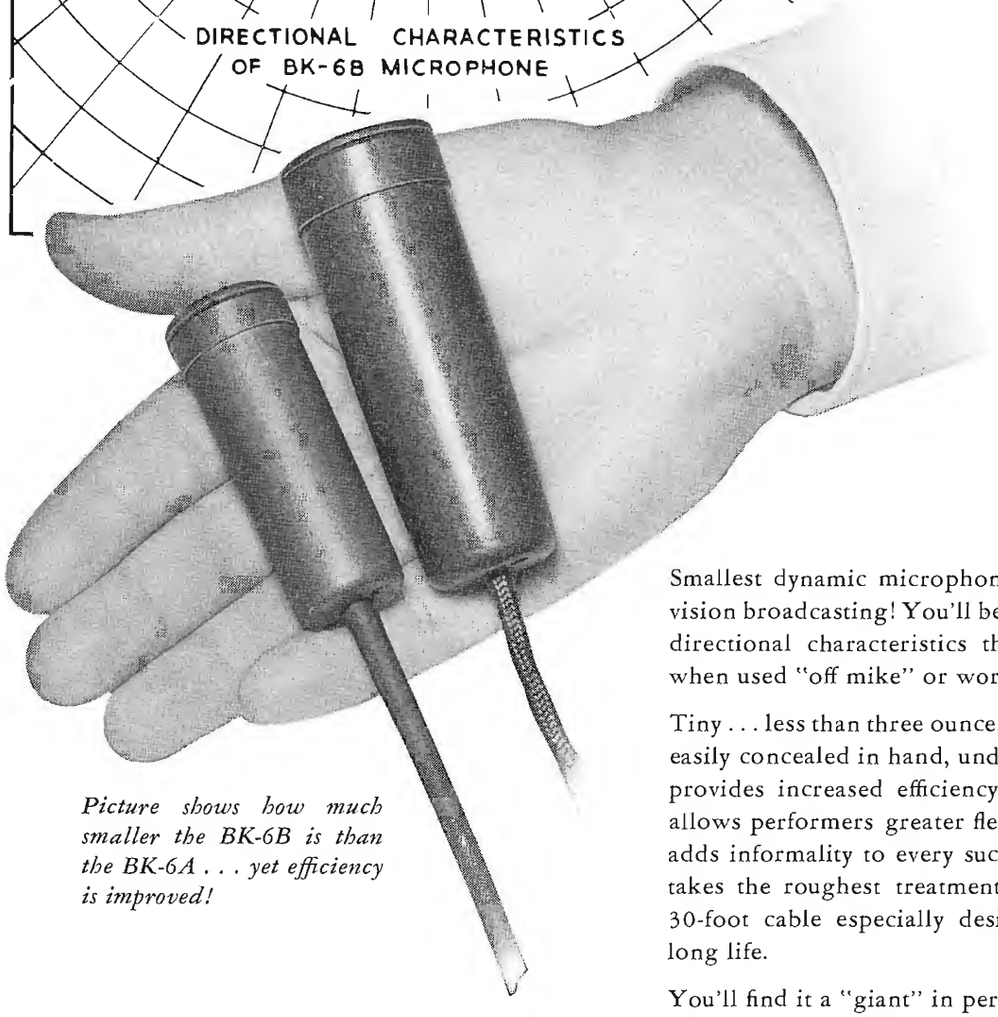


DIRECTIONAL CHARACTERISTICS OF BK-6B MICROPHONE

New PERSONAL MICROPHONE

RCA's BK-6B Miniature Mike

- **Half the size (by volume) of the BK-6A!**
- **Excellent speech balance when talking "Off Mike!"**
- **Wide range Frequency Response!**



Picture shows how much smaller the BK-6B is than the BK-6A . . . yet efficiency is improved!

Smallest dynamic microphone ever developed for radio and television broadcasting! You'll be amazed by its frequency response and directional characteristics that provide superior speech balance when used "off mike" or worn on the person.

Tiny . . . less than three ounces in weight, this new miniature mike is easily concealed in hand, under necktie, or corsage. Versatile . . . it provides increased efficiency to difficult walk-around operations, allows performers greater flexibility and freedom of movement . . . adds informality to every such production. Tough . . . the BK-6B takes the roughest treatment in stride, is furnished with flexible 30-foot cable especially designed for ease of manipulation and long life.

You'll find it a "giant" in performance for a wide variety of broadcast applications. Ask your RCA Broadcast Representative for complete information. In Canada, write RCA VICTOR Company Ltd., Montreal.

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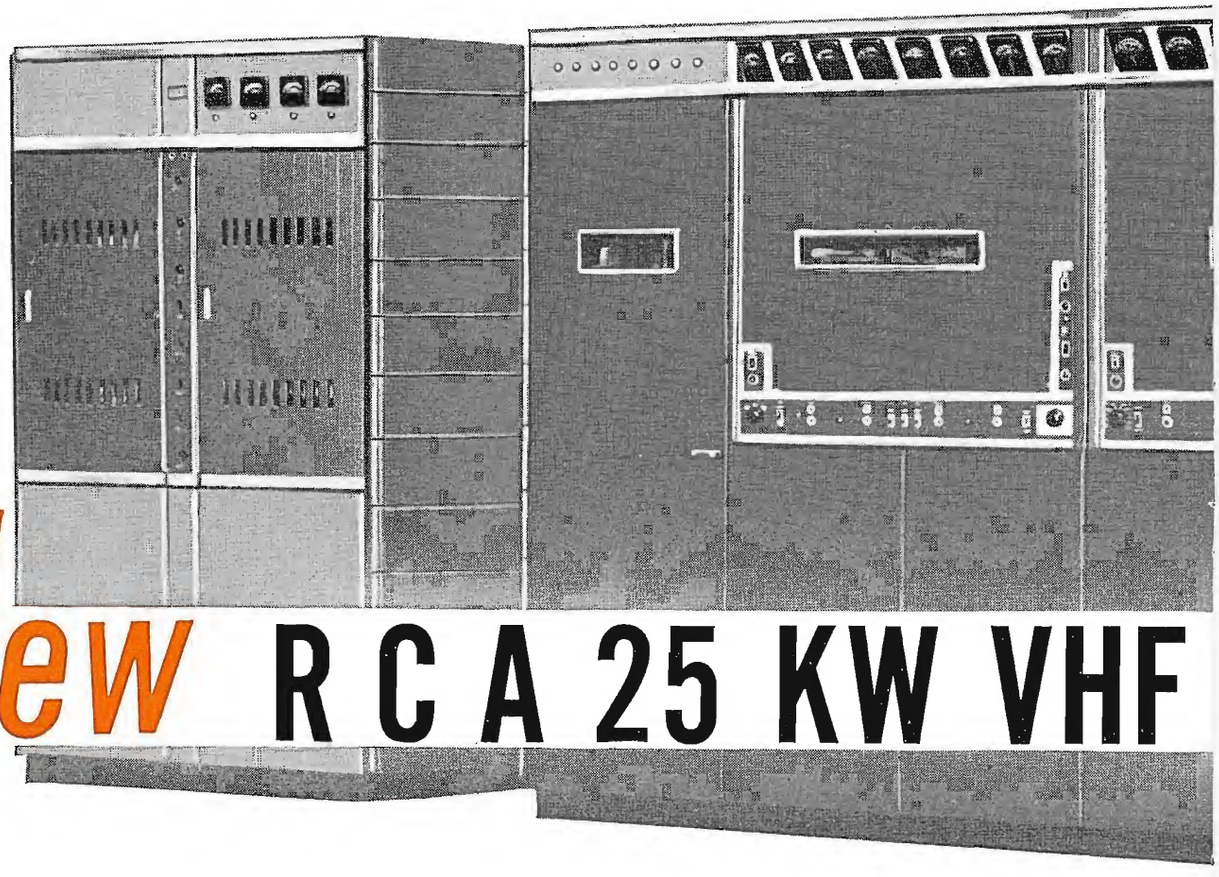
BROADCAST AND TELEVISION EQUIPMENT

CAMDEN, N. J.



New RCA 25 KW VHF

Assures flexible arrangement for economical floor plan

Combining all the newest design features of the recently announced RCA 6 KW TV transmitter and the enviable performance record of RCA's famous 25 KW power amplifiers, the new TT-25CL is today's best value! No other transmitter in this power class embraces so many advantages . . . advantages that engineers and station managers have asked to have incorporated in a single transmitter.

● **FLEXIBLE FLOOR PLAN**—The "block build" design of the TT-25CL permits several combination arrangements. The layout may be as illustrated in the accompanying floor plan, or a modification of this general plan. The 6 KW Driver and P.A. Rectifier and Control Cabinets can be arranged in "U" fashion with the P.A. tanks moved forward and the driver power supply enclosure placed at a remote location to further conserve space.

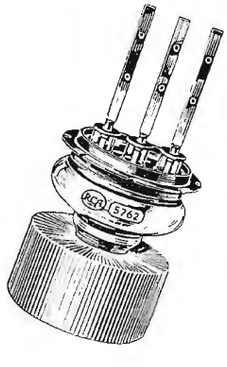
● **PRECISE COLOR PERFORMANCE**—Built-in linearity correction circuits and intercarrier frequency control, which accurately maintains frequency separation between aural and visual carriers, assure excellent color signal transmission.

● **EXCELLENT ACCESSIBILITY**—Broadband tuning controls in the 6 KW Driver are accessible without opening any doors. All important driver circuits are adjusted from the front of the unit. Exciter and modulator units have "tilt-out" construction for quick, complete accessibility.

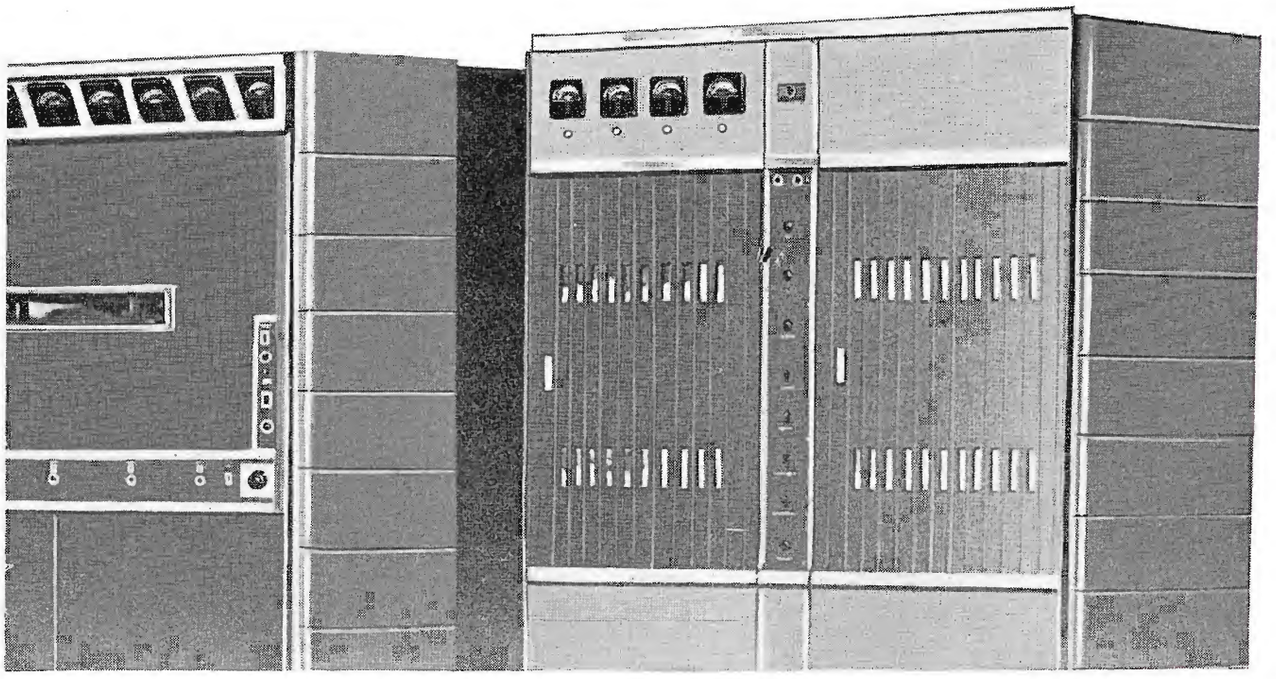
● **THERMOSTATICALLY CONTROLLED HEATERS**—for rectifier tubes are suited to ambient temperatures as low as 0° C. Designed for attended or remote-control operation.

● **ECONOMICAL OPERATION**—A well-chosen tube complement affords lower power costs. Complete overload protection with "grouped" indicator lights makes trouble-shooting quick and certain.

● **TIME-PROVED TUBES**—Long life RCA 5762 tubes in both P.A.'s and Driver. Many broadcasters using other RCA transmitters which employ the 5762 tubes report "extra dividends" due to their long-life, economical operation. Over 100 RCA 25 KW amplifiers have been in continuous service to date—each employs the famous 5762.



PLUS . . . OTHER ADVANCED FEATURES—too numerous to mention here! Get the complete story from your RCA Broadcast Sales Representative or write for descriptive literature (Catalog Bulletin B-4011). In Canada, write RCA VICTOR Company Limited, Montreal.



TELEVISION TRANSMITTER

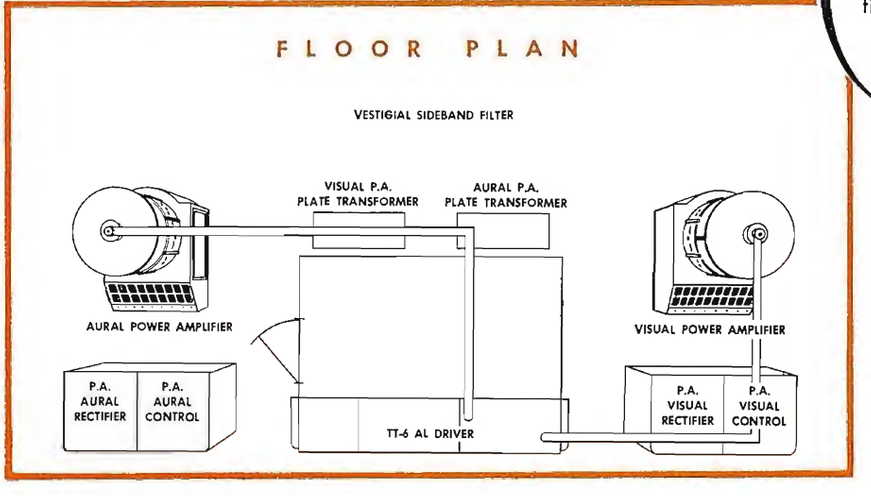
(Type TT-25CL, Low Band)

NOW "ON-AIR" AT WRGP-TV

CHATTANOOGA, TENN.

WRGP is receiving excellent reports on transmission since putting the TT-25CL "on-air." Particularly gratifying comments came from color program viewers who are impressed with the fidelity of WRGP color transmission.

FLOOR PLAN



DRIVER PORTION OF THE ABOVE 25 KW TRANSMITTER (LESS AMPLIFIERS) IS AVAILABLE AS A COMPLETE 6 KW TRANSMITTER

Where floor area is at a premium...

such as in "down-town" buildings, or where space must be yielded to other equipment, the TT-25CL is highly adaptable. When new transmitter buildings are contemplated, the space-saving TT-25CL helps to save building costs. The rectifier sections of both the 6 KW Driver and also the Aural and Visual Amplifier Rectifiers can be separated and placed in an adjacent room or basement. *This is an added feature that saves valuable operating area.*

RADIO CORPORATION of AMERICA

BROADCAST AND TELEVISION EQUIPMENT • CAMDEN, NEW JERSEY

How RCA Television is helping to solve the teacher-classroom shortage

The teacher above is *not* giving private spelling lessons. She has hundreds of unseen students scattered throughout many St. Louis schools. She is teaching them by television.

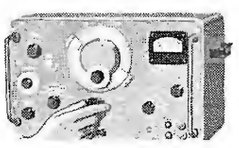
This is KETC, St. Louis' pioneer educational TV station where new, imaginative concepts of televised education are being developed by world renowned educators, TV producers and engineers. Their goal, like the many other educational TV stations, is to help alleviate the teacher-classroom shortage. In little more than a year, KETC has transmitted a successful grade school program, several college accredited courses, begun teaching technical subjects to plant workers in industry, and laid plans for a university of the air.

RCA Television Equipment plays an increasingly important role in teaching by TV, whether it originates from stations like KETC or is transmitted by closed circuit from within individual schools, colleges, and universities. Applicable to business, industry and medicine as well, RCA Closed-Circuit TV Equipment is built to strict professional standards with the accent on quality and reliability.

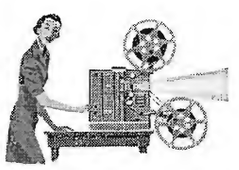
For free booklet on the profitable uses of RCA Television, or for information on other RCA electronic products, write Dept. GD-163, Radio Corporation of America, Commercial Electronic Products, Bldg. 15-1, Camden, N. J.

RCA Beverage Inspection Machine automatically checks bottled beverages for minute foreign particles, assures bottlers of dependable electronic inspection.

RCA Mobile 2-Way Radio provides instant 2-way communication between office and vehicles in the field. It speeds service, reduces mileage and telephone expense.



RCA Precision Instruments measure and test to laboratory-accurate standards. Used in designing, developing and producing complex electronic equipment and systems.



RCA 16mm Projectors are light weight, compact, simplest to operate. Used for selling, demonstrating, teaching . . . by businesses, schools, churches, hotels, institutions.

RADIO CORPORATION OF AMERICA

NOW —Another RCA first in Camera Tubes

MICRO-MESH

...the 750-mesh screen for RCA IMAGE ORTHICONS

RCA announces a major development—MICRO-MESH SCREEN—in Image Orthicon design that substantially improves the picture quality of TV cameras—*even beyond present-day high-quality standards of performance!*

In RCA MICRO-MESH, the fineness of the mesh has been increased from 500 lines per inch *to a new high of 750 lines per inch*—with a mechanical exactness heretofore unattainable. Here are a few ways this improvement works for you. (1) It eliminates mesh pattern and moiré effect without need for defocusing—both in black-and-white and color. (2) It permits improved picture-detail contrast. (3) It is particularly effective in color cameras where detail contrast cannot be improved by operating the tube above the knee.

Under continuous development for more than 5 years at RCA, MICRO-MESH in RCA Image Orthicons is evidence of RCA's intensive engineering effort to bring telecasters camera tubes of the highest possible quality.

RCA Image Orthicons—with new MICRO-MESH—are available immediately from your RCA Tube Distributor. For technical details on RCA Image Orthicons, write RCA, Commercial Engineering, Harrison, N. J.

ADVANTAGES OF MICRO-MESH

For black-and-white or color

- Eliminates mesh pattern and moiré effect *without defocusing.*
- More than meets all technical requirements of 525-line TV system.

For color only

- 750-mesh tube with aperture-correction circuit provides 100% response for 350-line information. 500-mesh tube without aperture-correction circuit permits only about 60% response for 350-line information. Although correction circuit can be used with 500-mesh tube, such use emphasizes moiré and beat-pattern problems.
- Minimizes beat pattern between color subcarrier and frequency generated by beam scanning mesh-screen pattern.
- Improves detail of color pictures.

RCA®

CAMERA TUBES FOR TELECASTING

RADIO CORPORATION OF AMERICA • HARRISON, N. J.

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